Henderson Fire Department

Equipment Operations Handbook

DRAFT

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Chapter

1

Apparatus

The Henderson Fire Department utilizes a wide variety of apparatus. The HFD takes pride in having a modern fleet of firefighting, specialized, and support apparatus. Currently the department is ready to respond with the following apparatus:

Station 81	Engine 81	Rescue 81			
Station 82	Engine 82	Truck 82	Rescue 82	Heavy Rescue 82	Batt. 8 EMS 8
Station 83	Engine 83	Rescue 83			
Station 94	Engine 94	Rescue 94			
Station 95	Engine 95	Rescue 95			
Station 86	Engine 86	AR 86	Fire Boat 86		
Station 97	Engine 97	Rescue 97			
Station 98	Engine 98	Truck 98	Rescue 98	Batt. 9	
Station 99	Engine 99	Rescue 99			

01 Apparatus

-01. Firefighting Apparatus

.01 Engines

The engine is the most essential piece of firefighting apparatus. The engines are comprised of a "triple combination" including a water tank, high capacity water pump, and hose. The HFD engines have pumps capable of flowing 1250 to 2000 gpm based on the type of apparatus. Currently all front line HFD engines have a 500 gallon water tank, and complements of hose including 1 ¾", 2 ½", 3", and 5" hose.

HFD currently uses the following frontline engines:

Two 2012 *Rosenbauer* engines (E97 #2083 and E98 #2084).

Two Third Generation *Pierce* Quantum engines (E82 #2063 and E99 #2070).

Three Second generation 2005 *Pierce* Quantum engines (E83 #2048, E94 #2047, and E95 #2046)

Three First Generation *Pierce* Quantum engines (E81 #2024 Reserve E #2022 Reserve E #2025)

Additional information on apparatus specifications and equipment inventories can be found on *Citynet* under *Resource/Reference* and *Vehicle Inventories*.

.02 Aerial Ladder Trucks

HFD operates two 2005 *Pierce* Quantum aerial ladder trucks (T82 #2044 and T98 #2045) out of Stations 82 and 98. T82 and T98 provide the department with a quick, efficient means of operating above ground by the use of a hydraulically operated aerial ladder. A "Truck" (as it is commonly called) carries a compliment of ground ladders, specialized tools and

equipment used for rescue, ventilation, forcible entry, salvage, and overhaul operations.

HFD aerial ladders are 100' in length, triple axle, rear mounted ladder trucks. An added feature of the truck is that it includes a platform (also known as the "bucket") to transport members of the truck company to the roof safely and quickly. The bucket allows for a stable work space for roof ventilation, and master stream water operations. The ladders consist of 3 sections and are constructed of metal with beams of a truss bridge type construction. Additionally, the trucks carry a complement of ground ladders including 35'& 28' extension ladders, 16' roof ladders, and 10' attic ladders.

.03 Skyboom

The *Pierce* Skyboom (E86 #2034) and Reserve Skyboom (#2035) is a triple combination/aerial ladder/elevated waterway with a 61' ladder. The Skyboom may operate as either an Engine (E86) or used as a Reserve Truck when either T82 or T98 are in for maintenance. The Skyboom pump is capable of flowing 2000 gpm. It has a 500 gallon water tank, and complements of hose including 1 ¾", 2 ½", 3", and 5" hose.

.04 Fire Boat

The HFD operates one fire boat (FB86 #2056) out of Station 86 at Lake Las Vegas. FB86 is a *Harbor Guard Boats* Fire Hawk 26'. Overall it is 27'8" long, 7'6" wide, and has a dry weight of 6400 lbs. The boat can hold 8 to 12 passengers. FB86 is a diesel powered jet boat and also has an additional diesel engine powering its fire pump. It is equipped with a deck gun as well as up to three 2½" discharges for fire suppression operations utilizing a 500 gpm pump.

-02. Specialized Apparatus

.01 Rescue

The HFD currently has eight frontline *Freightliner* Rescues. This apparatus is used for the transportation of the sick and injured. All rescues are equipped to perform paramedic functions. Equipment carried includes: a gurney, back boards, oxygen administration equipment, specialized medications, cardiac monitor, first aid supplies, and communication equipment that facilitate advanced life support functions.

.02 Heavy Rescue

The HFD operates one Heavy Rescue (HR82 #2062) out of Station 82. HR82 is built on the *Pierce* Quantum chassis. It carries personnel and equipment to fulfill the requirements of the HFD Technical Rescue Team. HR82 equipment includes equipment for high and low angle rescues, confined space, trench, swift water, hazardous materials monitors, and heavy extrication.

.03 TRV

The HFD operates three *Polaris* Trail Response Vehicles for use in off road rescues, and special event staffing. Based on need, the TRVs are housed between Stations 82, 86, and 99. The TRV is capable of off road rescue and transport of victims back to paved roads. The Six Wheel TRV equipment includes a gurney, medical equipment, stokes basket, and back boards.

-03. Support Apparatus

.01 *Chief Vehicles*

Currently the HFD is operating a fleet of both *Ford* (B9 #2051) and *Chevy* (B8 # 2054) pickups and *Chevy* SUVs for Battalion Chiefs, and Chief Officers. Each is designed for emergency transportation of department personnel and may be used for a variety of roles including mobile command posts.

.02 *EMS 8*

The department Medical Services Officers utilize a *Chevy* Suburban (EMS 8 #2053) designed for emergency response to incidents, and can also serve as a mobile command post. Equipment includes a cache of medical supplies and equipment that can be utilized on large scale emergency medical incidents.

.03 *Light Air Rehab*

The AR (AR86 # 2071) is built on an *International* 4400 4x2 cab/chassis. It is available for emergency response to provide or refill SCBA bottles, additional scene lighting, and rehabilitation supplies at the scene of an extended emergency event. AR86 is equipped with a high pressure *Bauer* K-22.42 compressor, generator, spare SCBA bottles, portable lights, a bathroom, and cache of rehab supplies including chairs, EZ-UPs, portable fans, heaters, and a 120 gallon fresh water tank for sink and rehab use. A supply of 24 spare SCBA bottles is maintained on this apparatus for immediate exchange at the scene of an emergency.

.04 *TRT Trailer*

This apparatus is equipped with tools and materials used during trench rescue operations. The equipment on the trailer includes circular saws, a cache of wood including various precut 2x4s and OSB for trench shoring.

.05 Equipment Technician Vehicle

The HFD Equipment Technician operates a modified *Chevy* pickup. This vehicle is designed for non emergency response. Equipment included on this apparatus includes replacement parts and pieces for the SCBA, power tools, ladders, and a cache of spare SCBA bottles that are available for immediate exchange. The HFD Equipment Technician operates out of Station 95.

.06 Bus

This apparatus is utilized to transport personnel during non-emergency operations. It is a *Chevy* cab/Eldorado national bus (#2067). The total capacity is 15 including driver.

.07 Logistics Vehicles

The Logistics division maintains and operates various *Chevy* pickups (#1706 and 2064) as well as an *International* 14ft Box truck (#2055) for station deliveries and special assignments.

Chapter

2

Tools & Equipment

Specialized tools and equipment are essential to successful firefighting and rescue operations. This section includes a sample of the common tools and equipment utilized by the Henderson Fire Department.

This chapter has been written under the premise and intent that will facilitate the addition or deletion of equipment as the need arises. The tools and equipment found in this chapter are limited to the typical equipment complement found on Engine Company inventories.

Specific Engine inventories can be found on CityNet→Department→Fire→Document Center→Vehicle Inventories

02 Tools and Equipment

-01. Hand Tools/General Equipment

.01 Lanterns: Streamlight Survivor LED is a light weight, right-angle flashlight to clip onto turnout gear for easy, hands-free use. Super-bright LED, narrow beam penetrates smoke, fog, and mist for improved visibility. Maximum lumens will produce a 4 hour runtime.

.02 Binoculars: Parks Optical 10x42

.03 Carbon Monoxide monitor: Industrial Scientific T40 Rattler is a low cost, maintenance free single gas monitor designed to protect personnel from dangerous carbon monoxide gas exposure.

.04 Temp Gun: The *CEN-TECH* temperature gun is an infrared laser thermometer that can be used to check temperature changes during HazMat incidents.

.05 HazMat pouch: contains the Centers for Disease Control and Prevention NIOSH guide to Chemical Hazards, The Emergency Response Guidebook: A Guidebook for First Responders during the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident (ERG), and HazMat IQ flip cards.

.06 Thermal Imaging Camera: ISG Infrasys Elite XR thermal imaging camera (TIC) provides thermal imaging at temperatures in excess of 2,000°F. The more you see, the safer you will be.

.07 Bee Veils: can be worn during bee swarm incidents to protect the wearer from bee stings to the head, neck, and face.

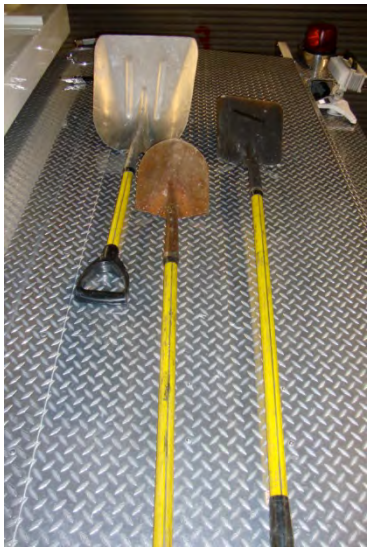
.08 Decontamination Kit: Is used for rapid gross decontamination in Hazmat rescue situations. The kit contains two *Tyvek* suits, soap, a roll of duct tape, scrub brush, and a garden hose (Rescue only).

.09 Drop Bag: Drop bags can be found carried with each SCBA. Each bag contains 50' of rope that can be used for multiple tasks including but not limited to tool hoist, search, and rescue

operations.

.10 Portable Radio: The frontline radio currently in use by the HFD is the Motorola XTS 5000R. HFD main communications channel is Zone 7 BATT9, and Zone 7 TAC 3 for all structure fire responses and multi companyincidents.

.11 Shovels: Fire suppression apparatus carry at minimum a Round Tip, Square Tip, and Scoop Shovel.



.12 Utility Rope Bag

.13 5 gallon bucket of absorbent

.14 Push Broom with handle

.15 Class A foam: ICL Performance Products Phos-Check WD881 Class A foam concentrate. Comes in 5 gal. buckets. Class A foam makes water far more effective for a variety of fire fighting applications. High quality foam reduces surface tension and increases penetration into the fuel. Class A foam is ideal for direct fire suppression, mop up/overhaul, structure protection, and many other operations.

.16 Class B foam: Angus Fire Alcoseal AR-FFFP is a superior quality Alcohol-Resistant Film-Forming Fluoroprotein (AR-FFFP) firefighting foam concentrate. HFD utilizes the 5 gal. 3% concentration. A protein base material provides a tough cohesive foam blanket with high resistance to heat that produces a vapor-sealing aqueous film on hydrocarbons.

.17 Easy Susan: Was designed to allow two firefighters to safely, effectively, and efficiently load 5 in. pre-rolled supply hose. An added benefit is the Easy Susan can load any size hose.

.18 Rubber mallet: Nupla rubber mallet. Rubber head weighs 2 lbs., overall length of 16".

.19 Fox tail broom

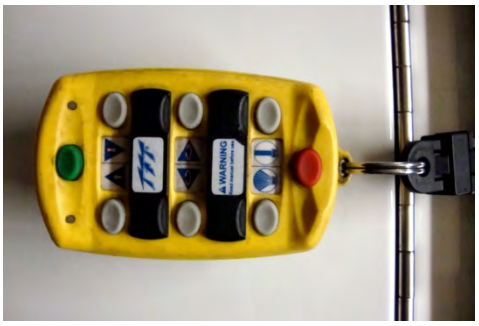
.20 Foam Bucket Wrench: The *Zephyr Industries* 70mm aluminum foam bucket wrench allows for quick and easy opening of foam bucket caps.

.21 Hydrant wrench: The HFD uses a *Red Head Brass* Adjustable Hydrant Wrench with Single Spanner Head Style 107. It will accommodate pentagon heads to 1¾" and square heads to 1¼". The single hook spanner head is designed to fit ¾" to 6" rocker or pin lug fittings.

.22 Hydrant key: Knox Keywrench provides access to fire hydrants secured with *Knox* anti-theft hydrant caps.

.23 Hose Spanners: HFD uses *Zephyr* Industries Model 17 and Model 27 combination spanners, *Akron* Brass Style 10 2½" spanners, *Akron* Akrolite Folding Pocket spanners Style #14**.**

.24 Hurricane Monitor Remote Control: The TFT Hurricane RC includes an electric remote control capable of operating the *TFT* Hurricane RC deck gun.



.25 Air hose

.26 Hose straps: *Akron Brass* Hose and Ladder Strap can be used to secure up to 3”hose on ladders, fire escapes, etc., and aids in the handling of hose. It is made of anodized aluminum with a 1” wide, flat, water resistant nylon

webbing.

.27 Lockout/Tag-out Kit: The *Brady* 65289 Lockout Safety Kit is a 12 piece lock out tag out kit containing gate and ball valve lockouts, lockout hasps, breaker lockouts, lockout tags, and padlocks to ensure lockout tag out safety.

.28 Vehicle Access kit: HFD uses the High Tech Tools Vehicle Access Tools Lockout Kit. This kit is designed to include the basic tools that are critical to gaining access in any vehicle lockout with little to no damage to the vehicle

.29 Tool Box

.30 Flat Head Screwdrivers

.31 Philips Screwdrivers

.32 SAE nut drivers

.33 Adjustable wrenches

.34 Battery puller

.35 Long nose pliers

.36 Diagonal pliers (side cutters)

.37 Slip joint pliers

.38 Arc joint pliers

.39 Hex wrench set

.40 Pipe wrench

.41 Hacksaw

.42 Ballpeen hammer

.43 Framing hammer

.44 Tape measure

.45 Circuit tester

.46 Kline cable cutter

.47 Air chuck with gauge

.48 Air nozzle

.49 T-handle PRV adjustment tool

.50 Plug N Seal patching paste

.51 Spring loaded window center punch

.52 Step chocks

.53 Door Chocks

.54 NY Hook: HFD carries *Fire Hooks Unlimited* NY Hooks in 6', 8', and 10' lengths. The NY hook has an all-purpose head and steel shaft that is an essential tool on any interior fire attack.

.55 Pike Pole

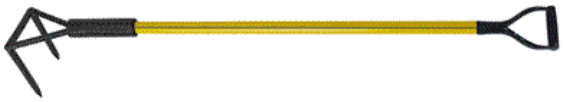
.56 Fire sprinkler head stoppers

.57 Security Torx wrench set

.58 Hose roller

.59 Squeegee with handle

.60 Rubbish hook: The *Nupla* rubbish hook was developed to find hidden fire in deep seated smoldering fires normally found in dumps or in dumpsters. The rubbish hook utilizes two, large, six inch, pointed prongs to grasp debris in huge chunks. It is also used as a rugged tool for ventilation of buildings constructed of modern sheet materials, such as plywood. It is the tool of choice for sounding a roof due to its broader surface.



.61 Street Key

.62 Swift water response bag: Each bag contains two of the following: personal flotation devices (PFD), knifes, whistles, helmets, throw bags.

.63 2 ½ gallon. Water extinguisher

.64 Dry chemical extinguisher 20 lb.

.65 CO_2 Extinguisher

.66 Salvage cover: 12’ x 18’ canvas salvage cover.

.67 Hall runners: 3’ x 18’ red vinyl made by *King Canvas*

.68 Salvage kit: Contains precut visqueen, staple gun, utility knife, duct tape, and extra mop head

.69 Closet Hook: *Nupla* 4 ft Closet Hook

.70 Pry Bar

.71 Hay hook

.72 Bolt Cutters: The HFD carries *H.K. Porter* 18”, 24, and 36” bolt cutters.

.73 Pick head axe: *Nupla* 6 lb. pick head axe.

.74 Flat head axe: *Nupla* 6 lb. flat head axe. The flat head axe along with the Halligan make up the "Irons".

.75 Halligan tool: The *Paratech* SPF Hooligan is a single piece forged (SPF) tool that is one of the world's most popular forcible entry tools. It is designed to pound, puncture, twist, and cut all types of barriers encountered by fire personnel. It is 30 in. long and weighs 9.7 lbs.

.76 Axe belt

.77 RIT Bag

.78 RIT Tarp

.79 RIT Binder

.80 MDT Computer: *Panasonic* Toughbook

.81 Gas Detector: *RKI Instruments* Multi Gas Detector GX-2012 can monitor the standard confined space gases.

.82 *Canberra* UltraRadiac Plus Personal Radiation Monitor is an easy to use radiation monitor that measures and displays radiation dose rate and total dose.

-02. Power Tools

.01 *AMKUS* Power Unit: *AMKUS* GH2S-XL Power Unit uses a *Honda* 4 cycle engine to power a high pressure two-stage pumping system to provide non-toxic mineral based hydraulic fluid to the

tools.

.02 *AMKUS* Spreader: The *AMKUS* AMK-30CX Spreader is capable of spreading up to 32.0 in. at a force of 16,950 lbs to gain access to victims requiring extrication.

.03 *AMKUS* Cutter: The *AMKUS* AMK-25 Cutter is an extremely compact, powerful and versatile tool capable of a 60,000 lb. maximum cutting force.

.04 *AMKUS* Rams: Both the *AMKUS* AMK-40R and AMK-60R provide a maximum push force of 30,650 lbs. and a maximum pull force of 14,400 lbs. The 40R over open length is 40.0 in. and the 60R open length is 60.3 in.

.05 *Holmatro* Power Unit: *Holmatro* PPU 15 Personal Power Unit uses a *Honda* 4 stroke engine to power a high pressure pumping system to provide up to 10,500 psi maximum operating pressure.

.06 Holmatro Spreader: The *Holmatro* 4242 Spreader is capable of spreading up to 27.25 in. at a force of 12,925 lbs, and the 4260 provides 33,000 lbs. maximum spreading force at up to 32.75 in. to gain access to victims requiring extrication

.07 *Holmatro* Cutter: The *Holmatro* 4050 NCT is capable of a 208,000 lb. maximum cutting force.

.08 *Holmatro* Ram bars: HFD carries the *Holmatro* 4332 and 4350 ram bars. The 4332 has a maximum spread force of 36,460 lbs and a maximum extended length of 64¼". The 4350 has a maximum extended length of $49^{15}/_{16}$" and a maximum 1st section spread force of 49,145 lbs. and 2nd section spread force of 18,210 lbs.

.09 *Honda* Generator

.10 50' extension cord and twist locks

.11 Sawzall: *DeWalt* DW309 reciprocating saw paired with an industrial grade, bi-metal demolition reciprocating saw blade can be used as another option to gain access to a victim during extrication operations.

.12 Detachable *Fire Research Corp.* 750 watt light

.13 Circular Saw: *Partner* K1250 is the most common power cutting tool used for forcible entry. It is equipped with a diamond tipped blade that can be used to cut through locks, hardware, steel doors, gates, and masonry among other applications.

.14 Chain Saw: *STHIL* MS460 is used primarily for ventilation purposes and is equipped with a carbide tipped chain.

.15 Gas blower: The *Unifire* DST3P4 series positive pressure ventilation (PPV) fan features large flat proof pneumatic style wheels and tires, 35" extendable handle, high performance *Honda* motor, stainless steel frame, is tiltable from -10° to +20°, and provides stand alone operation. It has an 18" four blade fan and can put out 22,000 CFM.

-03. Appliances

.01 Foam eductor: *TFT* 95 gpm inline foam eductor model UE – 095 has a metering head with easy-read knob for use with both Class A and Class B foam operations.

.02 Blitzfire: The *TFT* Blitzfire is a simple, light, and highly maneuverable attack monitor. It can go anywhere a handline goes while delivering much more water. If the Blitzfire starts to slide or lift, the safety shut off valve automatically shuts off the flow of water. It is capable of flowing 500 GPM at 175 PSI.

.03 Apollo monitor: *Akron Brass* Apollo Hi Riser Monitor Model 3431 with direct mount attachment and ground base with single 5" storz inlet. The Apollo monitor utilizes an *Akron* 250-1250 GPM fog nozzle or *Akron* stacked tips straight stream with 2½", 1¾" 1½", 1.375

.04 Stationary Deck gun: *TFT* Hurricane RC, *TFT* Crossfire

.05 Portable Hydrant: HFD carries an Angus 3 way distribution gated ball valve utilizing a 5" Storz to three 2½" male outlets.

.06 Hydrant Valve: When securing a water supply the HFD utilizes a *TFT* 2½" quarter turn hydrant valve as a secondary connection to the hydrant.

.07 PRO/Pak: The *TFT* PRO/Pak Foam System UM12 includes a high impact 2.5 gallon foam reservoir with a built-in eductor that can be set to the ratio of foam or wetting agents being used. A large, easy-open fill port has an indicator to show the type of liquid in the tank. The flow is controlled by a twist grip valve/carrying handle. It includes three nozzles for varied foam application.

-04. Fittings

HFD fittings include: caps, double female, double male, increasers, reducers, plugs, and wyes manufactured by *Red Head Brass*, *Akron Brass*, and *Task Force Tips*.

Fittings are identified in order by:

1. Size: female first – male last
2. Direction of flow – To indicate a direction of flow, use the word "to", example: 2½" to 1½" reducer.
3. Name of fitting

.01 Caps

All caps have female threads and fit over the male threads of the opening they cover. They are used to protect male threads and cap appliances or other fittings. Caps currently in use are: 5" Storz, 2½", and 1½"

.02 Double Female

A double female fitting has female threads on each end and is used to connect two male couplings. The threads may be the same or different sizes. Those currently in use are: 2½" and 1½"

.03 Double Male

A double male fitting has male threads on each end and is used to connect two female couplings. Those currently in use are: 2½"

.04 Increaser

An increaser is a fitting with female threads on one end and male threads on the other. It is used to connect a smaller male coupling to a larger female coupling. Those currently in use are: 2½"x5" Storz and 2½"x4"

.05 Reducer

A reducer is a fitting with female threads on one end and male threads on the other. It is used to connect a larger male coupling to a smaller female coupling. Reducers currently in use are: 2½" to 1½", 2½" to 1", 5" Storz to 2½", 1½" to 1"

.06 Plugs

All plugs have male threads and fit into the female threads of the opening that they plug. They are used to protect female threads and plug appliances or fittings. Currently the HFD only uses 2½" plugs.

.07 Wye

A wye is any fitting with one connection that has female threads and two connections that have male threads. They are used to divide one hose line into two lines. It may or may not be gated. The male threads may be smaller than, or the same size as the female. Wyes in use include the 2½" gated wye.

.08 2½" Line Gauge

The *Red Head Brass* Style 155 Threaded Encased Line Gauge is found in the High Rise Appliance bag and used during standpipe operations to monitor and control the PSI flowing to the high rise hose.

-05. Nozzles

There are two basic types of nozzles, straight stream and spray. Their purpose is to create and control the type of fire stream desired.

.01 Straight Stream Nozzles

A complete straight stream nozzle consists of a shut-off combined with a removable tip. Both ends of the shut-off are equipped with hose threads – one male and one female.

Straight stream nozzles increase velocity and give shape and continuity to the fire stream. They are particularly preferred for: penetration, deep seated fires, quick knockdown, and long distances. The HFD uses a 2½" playpipe with stacked tips sized 1½", 1¼", and 1".

.02 Fog Nozzles

Water has a greater cooling effect when applied in the form of a fog rather than a straight stream. A given quantity of water divided into smaller particles presents greater surface area for more rapid heat absorption. When properly applied, a fog stream uses practically all of the water in quenching and cooling.

Discharge from a fog nozzle may provide a flow of air toward the fire. While this may increase the intensity of the fire, it has the advantage of providing a flow of cool air at the nozzle.

Fog nozzles can use considerably less water than straight stream nozzles to affect the same results because of the added effectiveness of water applied in the form of a spray. They are therefore well suited for use in situations where the supply of water is limited. Also, fog nozzles have less nozzle reaction than straight stream nozzles under similar conditions.

The disadvantage of fog streams may include loss of water through evaporation, dissipation by wind, inability to span great distances, loss of striking power and penetration.

The HFD uses the *TFT* 2½" Fog nozzle, and 1½" *TFT* fog nozzles.

.03 Piercing Nozzle

.01 The *Akron Brass* Piercing Nozzle and Shut off can be used through concrete block, cars, mobile homes, etc. It is designed to get water or foam into hidden trouble spots. The driving button and point are made of hardened tool steel with impinging jets for a dense fog pattern.

.04 Foam Adaptor

Currently the HFD utilizes the *TFT* MX-FOAMJET and the FJ-H Air-aspirating foam-making attachment. They provide a flow range of 70 - 200 gpm.

Chapter

3

Self Contained Breathing Apparatus (SCBA)

The Self-Contained Breathing Apparatus is one of the most vital fire ground tools. SCBA use shall be in accordance with **HFD Equipment Guideline EG-02 SCBA** and **IPS-02 Donning SCBA** Task Standard. The SCBA allows you to carry your own air supply that is entirely independent of the outside atmosphere. Compressed air is contained in the SCBA cylinder. High pressure air (up to 4500 PSI) is reduced by the first and second stage regulator to a breathable pressure. Exhaled air is exhausted to the outside via the mask.

The air cylinder is attached to the back pack harness which contains both regulators. The HFD uses the Dräger PSS 7000 SCBA. The Dräger SCBA is designed to provide the wearer with respiratory protection while working in hazardous atmospheres. This unit may be used for entry into and escape from hazardous or oxygen deficient atmospheres.

The SCBA Consists of 7 Major Component Groups:

1. Back pack and harness assembly
2. Air Cylinder
3. First stage regulator / whistle alarm system
4. Second stage regulator (LDV)
5. Sentinel 7000 PASS device and PASS alarm enunciators
6. Buddy breathing connection
7. Face mask with heads up display and voice amplification systems

Back Pack and Harness:

A key feature of the Dräger PSS 7000 is a newly designed harness suspension system that provides the ultimate in comfort and wear. The system features advanced compression-molded comfort padding. The high grip anti-slide outer surface of the harness is made from a vulcanized chloroprene rubber for the necessary stability to keep the harness securely in position. A unique feature of the Dräger SCBA is a backplate that provides unrestricted movement that can fit the torso lengths of different firefighters. The carbon fiber composite backplate features a unique 3-position height adjustment. This feature allows the wearer to adjust the height of the backplate within seconds. The backplate automatically lengthens and pivots to accommodate the user's movements, and the unique self-adjusting, pivoting waist belt allows the backplate to do this. In addition to an increased range of movement, the weight of the SCBA rides on the hips to reduce back strain. This also increases stability and balance by providing a lower center of gravity. The carry and drag handles have carabineer and webbing connection points. The side handles have a pull force of up to 600 lbs., and the yoke has a pull force of up to 750 lbs.

Reflective shroud for increased safety

Sentinel™ 7000 Digital Gauge

Swivel & Pivot Waist Belt

"Slide and Lock" Harness Connections

Integrated Hose Channels

Buddy Breathing Multilink

Pull Forward Waist Adjustment

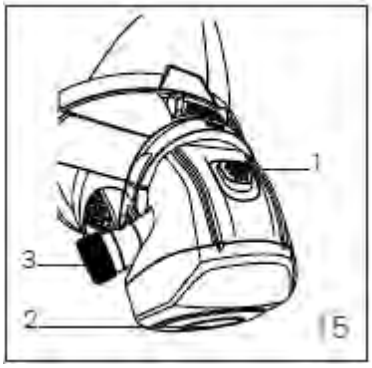
Air Cylinder:

The air cylinder utilizes a composite carbon fiber construction. A pressure indicator, built into the cylinder valve, indicates the pressure of air currently in the cylinder. The gauge is graduated in 1000 PSI increments ranging from 0 to 4500 PSI. A cylinder that is full (bottle range 4000-4500 PSI.) is identified on the gauge in green. There are two sizes of air cylinders; 45-minute and 60-minute. When full, the cylinders contain 66 and 88 cubic feet of air respectively and will provide air supply time of 45 minutes or 60 minutes at a user rate of 40 liters per minute during moderate activity. Actual air supply time will vary, depending on demands of the user, and will frequently be less. The air cylinder is hydrostatically tested every five years. An added feature of the air cylinder is its ability to utilize the quick connect lock and load system for quick air cylinder swap out.

First Stage Regulator

The first stage regulator combines a pressure regulator and EOST whistle alarm system in one compact assembly. The first stage regulator reduces air cylinder high pressure to approximately 100-110 PSI (medium pressure). This medium pressure is found in the hose from the first stage regulator to the second stage regulator, and in the hose to the buddy breather. The audio alarm activates a whistle when the remaining usable air supply has dropped to approximately 20% - 25% of cylinder capacity, or a cylinder pressure of approximately 1215 to 1035 PSI. In addition, there is an integral pressure-limiting device built into the first stage body, which maintains a safe outlet pressure in case of failure within the primary regulator (due to wear, corrosion, damage, etc.). If failure of the first stage regulator occurs, the regulator will fail in the "open" position and the whistle will sound to alert the user that a failure occurred. The user is able to continue breathing at normal respiratory rates. If this occurs, notify your partner and immediately exit the hazardous environment. Other features found connected to the first stage regulator include the cylinder quick-connect system, and Protected UAC fitting.

Second Stage Regulator (LDV)
The second stage regulator (Figure #15) reduces the air pressure received from the first stage regulator to just above atmospheric pressure. The regulator is carried in a holster mounted on the right waist belt. The regulator mounts to the face mask in a "quick-connect" fashion. Push the lung demand valve into the face mask opening until a "click" is heard. To begin "on-air" breathing, inhale or depress the LDV manual override button (2).



Bypass
The red bypass valve (3) is capable of supplying 80-120 liters of air per minute, depending on how far the valve is turned. This valve has a detent to prevent accidental activation of the bypass. Depress and turn the valve counterclockwise to activate. The bypass valve can be used when needed to provide a flow of air above atmospheric pressure and will consequently reduce the duration of air supply to the user.

Release/Shut Off Buttons
The black release buttons are used to remove the regulator from the holster and face mask. When removing the regulator from the face mask, first press the black shut-off button (1) on the LDV to turn off positive pressure. Then depress the black release button on the face mask and twist off the LDV to remove the regulator.

Sentinel 7000
The Sentinel 7000 electronic monitoring system is a multi-function system that provides continuous monitoring of the SCBA status including remaining cylinder pressure, movement of the wearer, main battery condition, end-of-service time (EOST) and PASS. It provides visual indications of system status and audible and visual alarms in warning conditions. User control and monitoring of the system is through a user interface that incorporates switches, LEDs, a liquid crystal display (LCD) display screen and an alarm sounder. A backlight illuminates the user interface display screen when required. Additional alarm sounders are mounted on the back of the backpack to the left and right of the air cylinder, with warning LEDs on the top and bottom, and operate only during PASS alarms. The operating settings are preset and non-adjustable by the user. The motion sensor in the PASS is an accelerometer. The accelerometer is more sensitive swinging left to right than front to back. It must be in motion, and changing direction to reset the PASS alarm.

Activation: The PASS function of Sentinel 7000 electronic monitoring system is an alarm system that can be activated manually or automatically. The automatic alarm uses a motion sensor to detect movement and activate a pre-alarm and main alarm at timed intervals when no movement is sensed. The manual

alarm is activated by a yellow press button on the user interface. When activated the following self-check sequence will commence:

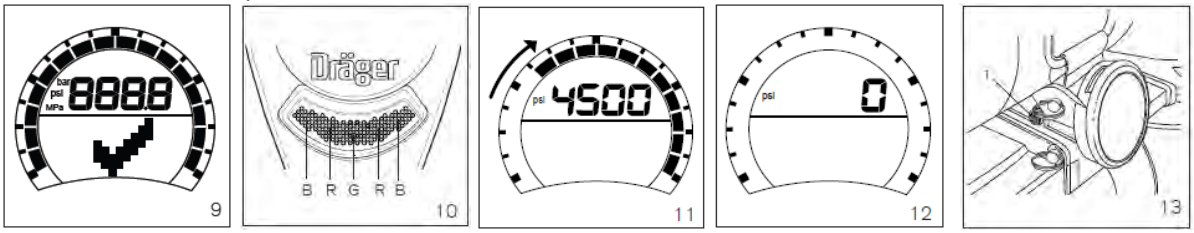
First stage – The Sentinel 7000 will emit a single tone from the user interface and the additional alarm sounders, and the display backlight will illuminate.

Second stage – The display will show a tick symbol (Fig 9); the blue, red and green LEDs (Fig 10) will illuminate.

Third stage – The display will show the cylinder type (Fig 11) (2216 PSI or 4500 PSI).

Fourth stage – The display will show the normal operating screen (Fig 12); the blue, red and green LEDs (Fig 10) will illuminate; the blue and red LEDs (1, Fig 13) will illuminate.

End of sequence – Two 'trill' alarms will sound; the display will show the normal operating screen (Fig 12); the green LED (Fig 10) will flash at approximately one second intervals to confirm that the Sentinel 7000 has passed the self check and is in the active mode.



Up to approximately 45 seconds after the start of the self check, all six HUD LEDs (Fig 14) will flash twice to indicate that the Sentinel is communicating with the HUD. The HUD LEDs (red/amber/green/green) will flash (on for 15 seconds/off for 45 seconds). Check that the blue LEDs on the backplate are functioning.

React to the following alarm and warning signals as necessary:

PASS Pre-Alarm – Alarm starts after 20 seconds with no PASS movement. A repeating audible alarm tone (3 medium tones, then 1 low tone in succession; Volume increases from 25 to 29 sec.) will be emitted from the user interface sounder and the additional alarm sounders. Move the user interface to cancel the alarm (do not attempt to use the buttons to switch off the pre-alarm).

PASS Full Alarm – Full alarm will activate after 30 seconds with no PASS movement. A high-level sweeping alarm (continuous ascending low to high tones) will be emitted from the user interface sounder and the additional alarm sounders; red and blue LEDs on the user interface and top and bottom of the additional alarm sounders will flash intermittently; the user interface will show the alarm icon. PASS full alarm emits 95 decibels at 10' in all directions. Simultaneously press and hold the RH and LH buttons of the user interface to cancel the alarm.

50% Air Alarm – PASS will emit 2 identical loud electric tone beeps at 2250 PSI.

EOST 25% Air Alarm – The EOST alarms will activate when the PSI drops below 1125 PSI. The user interface will emit an audible alarm tone (continuous electronic cricket tones 2 seconds on and 2 seconds off), and red and blue LEDs will flash; the red LED on the HUD will flash; the mechanical whistle on the first stage regulator will sound. The mechanical and electric alarms are independent and one may start before the other. The mechanical whistle will operate independently of the Sentinel electronics. Either of the EOST 25% alarms may start at up to 1180 PSI.

Dräger LED Light Explanation

Sentinel PASS device 5 LED's

1 green Flashes continually when PASS device is sensing or any alarm.
2 red Flash continually when PASS device is in low air or full alarm.
2 blue Flash continually when PASS device is in low air or full alarm.

Back frame 4 LED's

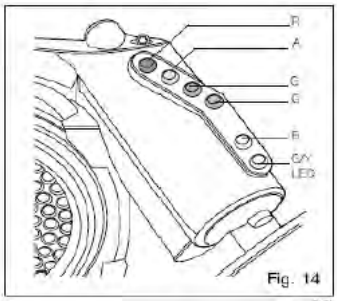
2 blue face down and flash every 20 seconds when PASS is in sensing mode.
2 blue face down and 2 red face up. Flash every 5 seconds during low air alarm.
When in Full Alarm Mode the same 2 blue and 2 red flash continually and rapidly when PASS device is in full alarm.

Low main battery – A low battery icon will be displayed on the user interface or the Green/Yellow battery LED will flash yellow.

Low HUD battery – The Green/Yellow battery LED will flash green.

Loss of HUD communication – The HUD blue LED will flash

Cylinder Air Level	HUD LEDs			
	Red	Amber	Green	Green
Full to 3 /4	●	●	●	●
3 /4 to 1 /2	●	●	●	
1 /2 to 1 /4	●	●		
1 /4 to approx 100 psi	●			



Mask Heads Up Display (HUD)

When the SCBA is turned on, all 6 mask LEDs illuminate to full brightness on startup. The wireless signal (blue), and low battery LED (green/yellow) are the last 2 LEDs. After initial start up, the 4 pressure LEDs are on for 15 seconds and off for 45 seconds. The Cycle will repeat itself. Any ¼ pressure change causes lights to refresh and restart the 15-45 cycle. Depressing the right button on PASS refreshes and restarts the 15-45 cycle. An ambient light sensor adjusts brightness of LED's.

HUD Pressure Gauge

Uses 4 LED's in succession. (15 seconds on 45 off)
2 green, 1 yellow, 1 red
Full 4500 - 3376 PSI 2 green, 1 yellow, 1 red
¾ 3375 - 2251 PSI 1 green, 1 yellow, 1 red
½ 2250 - 1126 PSI 1 yellow, 1 red flashing yellow for 20 seconds then 15-45.
¼ 1125 - 0000 PSI 1 FLASHING BRIGHT RED CONTINUOUS. No 15-45 cycle.

Buddy Breathing Connection

The Buddy Breathing Connection is to be used in emergency breathing situations. Buddy breathing allows one member without air to share breathing air directly from another member's air supply. This procedure is used to assist another firefighter that may be low and or out of air. The buddy breathing line is a quick connect line that can be connected to either port by the opposite port from another firefighter's buddy breathing line. If a firefighter is out of air they must stay connected to the other person's buddy breathing line until out of the IDLH. The buddy breathing line does not fill air from one cylinder to the other. For example; if firefighter A is out of air he can connect his buddy breathing line to firefighter B, firefighter A is now breathing off of firefighter B's SCBA. The buddy line should always be kept in the pouch and the caps always kept on the port ends. The buddy breathing "Y block" is located in the pouch on the left hip. The "Y block" hose is 40 inches, allowing 80 inches between firefighters when connected. The "Y block" system allows multiple packs to be daisy chained together.

Face mask

The face mask is comprised of a silicone rubber skirt creating a triple sealing edge, 5-point head harness or head net, second stage regulator (LDV) connection, heads up display, and voice amplification system. The face mask comes in three sizes S, M, and L, and provides a wide unobstructed field of view.

When the voice amp is turned on it will give battery condition with beeps. 3 beeps indicate fully charged. 2 beeps indicate ½ capacity. 1 beep or no beeps requires battery replacement. The voice amp on the mask uses 2 AAA batteries. Use finger pressure (no tools) to open and close the battery cover. Check the communication dock screw opposite the battery cover and make sure it is finger tight from time to time.

Donning/Doffing

The process to don and doff the SCBA shall be in accordance with HFD **IPS-02 Donning SCBA** Task Standard.

RIT Pack

The RIT pack includes a high pressure bottle (4500 PSI 60 minute 88 cu ft.), face mask (no voice amplification or HUD), rapid fill UAC coupler, buddy breathing connection, second stage regulator, webbing, flashlight, and rope.

Air Cylinder Over Pressurization

Department personnel need to keep an eye on SCBA bottles for over pressurization.
How does a bottle become over pressurized?

A bottle filled to near 4500 PSI when the season is cooler, and cool inside the station, will heat up on warmer days causing increased pressure. As it gets hotter and hotter, more bottles will creep over 4500 PSI. A couple of packs and one RIT pneumatic have been taken out of service because of this.

Leaving a full bottle exposed to direct sunlight on a hot day will easily increase pressure in the bottle to over 5000 PSI. As the season continues to warm up some bottles may need to be purged a couple of times if they are kept near 4500 PSI.

This may seem insignificant but it is not. A bottle with "extra air" over 4500+ PSI, and the valve open on your SCBA may cause the pressure release valve on the SCBA first stage regulator to open and slowly bleed off the air dropping the pressure down to about 3400 PSI before resetting. You will not hear it unless you put your ear close to the first stage regulator. That's how it works. The air cylinder is being safe because it has too much pressure in it!

A bottle is full at 90% to 100 % capacity. This equals 4050 to 4500 PSI.
4501 PSI is over pressurized and shall not be used.

THIS IS SERIOUS!
Please do not use a bottle with over 4500 PSI on your SCBA. THERE IS NO ADVANTAGE. You may end up with less air than usual and an Out Of Service SCBA. Please purge excess pressure from your SCBA bottle while separated from the pack before use. Every time an SCBA pressure release valve vents pressure, its threshold for release becomes slightly lower the next time. Eventually this can take the SCBA out of service.

Chapter

4

HFD Hose Manual

The purpose/intent of the HFD Hose Manual is to standardize the methods, skills, and knowledge to be employed by personnel of the Henderson Fire Department in relation to fire ground hose evolutions.

It shall be the responsibility of all members of the Henderson Fire Department who may be required to execute hose operations as a part of their normal duties and function to remain familiar with and be able to perform the practices outlined in this document.

This document shall consist of this cover page and all related subsections which deal with one or more specific hose operations and or evolutions adopted by the Henderson Fire Department.

This document has been written under the premise and intent that will facilitate the addition or deletion of material as the need arises.

The attempt will be to cover all practices which a firefighter may be called upon to perform during basic hose evolutions as may be dictated, but not limited to, emergency incidents and training scenarios.

Most commonly, the primary responsibility of an engine company is to apply an extinguishing agent to an existing fire. Although engine company members are often required to perform tasks other than agent application, this Chapter is dedicated to the various evolutions used to provide water to a fire.

There are many factors which will determine the type of hose evolution to be applied to a given situation. Whether or not fire is visible during response, the volume of fire, the location of the fire, exposure problems and potential life hazard are but a few of the factors which will determine the size and number of lines to be used. This information is taken into account by the first arriving officer. The method of choice must be put into operation quickly, safely and effectively.

Hose General
Hose used by the HFD is of the following sizes: 5", 3", 2½", 1¾", and 1". Hand line hose lengths come in 50' and 100' sections, but may be shortened during repairs.

Hose Construction
The fire service uses the following national standards for fire hose and couplings:

NFPA 1961 – Standard on Fire Hose
NFPA 1962 – Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles
NFPA 1963 – Standard for Fire Hose Connections

Currently, the HFD uses two types of fire hose:

1. Synthetic double jacket, rubber lined N-Dura® hose (hand lines, 3").
2. Nitrile, rubber lined (5").

Hose Maintenance
The typical warm climate in Southern Nevada allows wet hose to dry quickly, however, it is important that dirty, wet hose be properly cleaned. Hose shall we washed with clear, cold water, and mild soap when heavily soiled. Soap must be thoroughly rinsed from hose prior to reloading on the apparatus.

Repairs
Hose shall be repaired by the HFD Logistics Division. Damaged hose forwarded to Logistics shall be clean, dry, rolled, and Red Tagged.

Rolling Hose
Hose is rolled to simplify storing, carrying, and deployment during emergency and nonemergency situations. Different hose rolls will permit more effective fire ground operations and efficient cleanup. There are several methods for rolling hose:

- In-Service Roll (Donut)
- Out of Service Roll
- Double Donut Roll
- Large Diameter Hose Roll
- Drain & Carry

When rolling hose for use (In-Service Roll), it shall be rolled with the MALE coupling forming the core.
When rolling hose for storage (In-Service Roll) it shall be rolled with the MALE coupling forming the core.
When rolling hose for repair (Out of Service Roll), it shall be rolled with the FEMALE coupling forming the core.

Task Benchmarks – In-Service Roll

1. Lay the hose out flat and straight on a clean surface.
2. Begin rolling the hose at the male coupling and tightly fold coupling onto top of the hose. Continue to roll the hose towards the female coupling. Keep the edges of the hose aligned.
3. When reaching completion of the roll, do not roll the hose over the female coupling. Lay the hose roll on its side and wrap female coupling into the roll.
4. Protruding hose roll edges can be made orderly by stepping on the roll while still flat on the ground.
5. Prepare hose for deployment. Stand hose roll on end with female coupling on the ground. Secure the roll with both hands along edges of roll.

6. Ensure a safe work area before deployment.
7. Unroll hose using a "bowling" movement. Keep the roll aligned and hose straight. Protect male coupling as it is unrolled.

COUPLING AND UNCOUPLING HOSE

The terms coupling and uncoupling hose defines the process of attaching and disconnecting male, female, and storz couplings to any two sections of hose. The process of coupling and uncoupling hose sections together requires screwing together threaded male and female hose couplings, or snapping together two storz couplings to make a continuous water way. The need for speed and accuracy under emergency conditions requires that specific techniques be used. In many cases, nozzles and fittings may be attached and detached using the same techniques for coupling and uncoupling hose. The following methods should be used when coupling and uncoupling hose:

- Foot-Tilt Method
- Two-Person Method
- Utilizing Spanners Method (Tight Coupling)

Hose Line Safety

To provide greater safety for personnel and equipment while using hose lines, the following procedures shall be adhered to:

1. Nozzles shall be shut off after attachment to hose lines and at any other time the flow from the nozzle ceases.
2. When practical, hose lines that are operated from ladders, roofs, or other heights shall not be charged with water until after such lines have been secured in position.
3. Where possible, hose to upper floors shall be cleared from ladders and secured in order to provide safe operation.
4. Personnel shall not direct or cause a stream of water from a line to be directed upon any person or into any premises unnecessarily.
5. Care must be taken any time hose streams are used from ladders, as to not put undo forces on the ladder.

Backing-Up the Nozzle

The purpose of backing up the nozzle is to relieve the strain caused by the reactionary force of the stream. Positions of members holding the hose line should be staggered. Do not crowd the member at the nozzle. Keep the hose line free of sharp bends, and maintain the hose in-line with the nozzle to absorb back pressure.

The method of Backing-up the nozzle/hose depends largely on the number of members available, size of the hose, pressure, location, and the length of time the hose is to be used.

Hose Combinations

To effectively carry out firefighting operations, it may be necessary to extend, reduce, increase, or wye off hose lines. Various combinations of hose, nozzles, and fittings are used for this purpose. It is recommended whenever possible that all hose, nozzles, and fittings are assembled before connecting to the original working line. A detailed list of HFD nozzles, appliances, and fittings can be found in ***Ch. 2 Tools & Equipment*** sections -03 through -05.

Hose Compliment

All Engines carry the following hose:

1. 200 ft. 1¾" pre-connect cross lays (2)
2. 300 ft. 1¾" pre-connect (1)
3. 100 ft. 1¾" pre-connect (1)
4. 300 ft. 2½" pre-connect (1)
5. 800 ft. 5" dead load
6. 300-400 ft. 2½" dead load
7. 100 ft. 1¾" Feed Bags (2)
8. 50 ft. 2½" High Rise Bundles (3)
9. 100 ft. 1" rolled PRO/pak hose (1)
10. 3" rolled Soft Suction (1)
11. 5" rolled Soft Suction (1)

Loading Hose

Hose is used in two basic ways, in a supply capacity it transports water from the source to the pump, and in an attack capacity it transports water from the pump to the nozzle(s). Hose should be arranged in the hose bed so that when the hose is laid, the end with the female coupling is towards the water source and the end with the male coupling is towards the fire. All threaded appliances and fittings are constructed following this philosophy.

Hose loading is standardized across the department. 1¾" cross lays on Pierce & Rosenbauer Apparatus are pre-connected with two loops for ease of removal and deployment. 2½" is loaded at the rear of the apparatus in both a pre-connected minuteman load for easy one, two, or three member deployments, as well as a 2½" dead load (flat load). 5" supply line is also loaded flat.

When loading hose, a few basic guidelines should be followed:

- When possible, load clean, dry hose
- Assure ground is clear of dirt and debris before laying out hose to be loaded
- Check for the presence of gaskets in all swivels
- Connect hose so that the edges are in the same plane
- Hand-tighten all connections
- Load the hose so that couplings will pull off without flipping over. This may require a *Dutchman* in the hose (see explanation below)
- Avoid packing hose too tightly
- Keep folds at edge of bed and neatly organized, do not place couplings too close to folds

Hydrants

Fire hydrants in the City of Henderson are of two types, Public and Private. Both types are dry barrel hydrants, with a 5" and two 2½" threaded discharges. The standard is that Public COH hydrants are painted yellow, and Private hydrants on privately owned land are painted red. Although this is usually the case a situation may arise that hydrant color might not match with use.

Two Phases of a Hose Evolution

Supply Phase: That phase of a hose evolution which allows the engine apparatus to secure a constant source of supply from a hydrant.

Fire Fighting Phase: The removal of the selected line or lines from the apparatus and the advancement of those lines to the objective.

Forward and Reverse Evolutions

Forward Evolution (Hydrant to fire): The type of hose evolution which begins with the laying of a line from a hydrant or other source of supply. Supply Phase should be completed first.

Reverse Evolution (Fire to hydrant): The type of hose evolution which begins at the fire and proceeds to the hydrant or other source of supply. Fire Fighting Phase should be completed first.

Definitions:

Coupling: Couplings are to be hand-tight, unless conditions warrant the use of a spanner.

Dressing the hose: Make it orderly. This enables finding the hose patterns. It also removes some of the kinks from the hose.

Nozzles: When a nozzle is connected or grounded, it shall be shut off in all cases. When grounded, the hose is straightened for at least 5' behind the nozzle.

Dutchman: A *Dutchman* is placed into the hose load to prevent a coupling from flipping over when the hose is pulled from the bed. It consists of a small section of hose folded back on itself next to a coupling. The *Dutchman* is placed on the side of the coupling opposite the direction that the hose would normally be pulled from the bed. A Dutchman is not required in a hose bed where the hose may be deployed in either direction (transverse pre-connect).

Hose Evolutions

The hose evolutions required to be performed by all Fire Rescue Operations Personnel include the following Task Standards:

- TS-01 Fast Attack
- TS-02 2½" Hose Deploy – One Person
- TS-03 2½" Hose Deploy – Two Person
- TS-04 2½" Hose Deploy – Three Person
- TS-05 Foam Eductor
- TS-06 Foam PRO/pak
- TS-07 Fire Attack High Rise Standpipe Evolution
- TS-08 3" Hose to 1¾" Feedbag
- TS-09 Portable Monitor Attack
- TS-10 Deck Gun (Blitz Attack/Defensive Ops)
- TS-11 Elevated Master Stream
- TS-12 Relay Pump
- TS-13 Elevated Master Stream (Sky-Boom)

Chapter

5

HFD Ground Ladder Manual

The purpose/intent of the HFD Ground Ladder Manual is to standardize the methods, skills, and knowledge to be employed by personnel of the Henderson Fire Department in relation to ground ladder practices.

It shall be the responsibility of all members of the Henderson Fire Department who may be required to execute ground ladder operations as a part of their normal duties and function to remain familiar with, and be able to perform the practices outlined in this document.

This document shall consist of this cover page and all related subsections which deal with one or more specific ground ladder practices and/or evolutions adopted by the Henderson Fire Department.

This document has been written under the premise and intent that will facilitate the addition or deletion of material as the need arises.

The attempt will be to cover all practices which a firefighter may be called upon to perform during ground ladder evolutions as may be dictated, but not limited to, emergency incidents and training scenarios.

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Ladder Basics – Terms

Terms: It shall be the responsibility of all members of the Henderson Fire Department who may be required to execute ground ladder operations as a part of their normal duty and function to remain familiar with ladder terms and definitions.

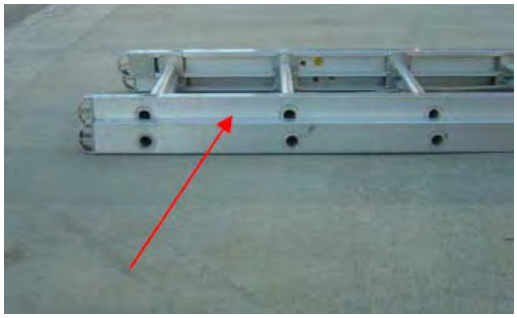
Ground Ladder: Term used to designate the difference between ladders raised on the ground and those raised from the apparatus such as a Truck Co. or Ladder Co.

Straight Ladder: Used to identify a ladder of one section (also known as a single ladder or wall ladder).

Extension Ladder: Term used to identify a ladder with two or more sections.

Bed Section: Describes the lower section or bottom section of an extension ladder (also known as the main section).

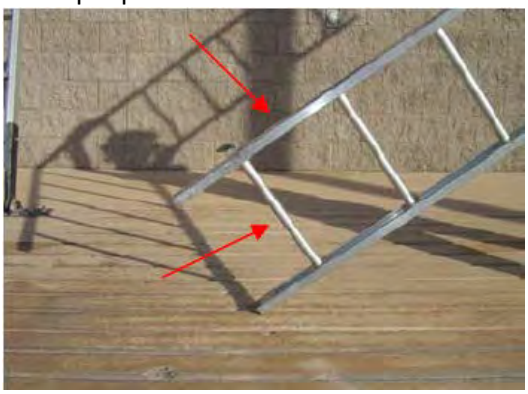
Fly Section: The upper section or top section of an extension ladder.



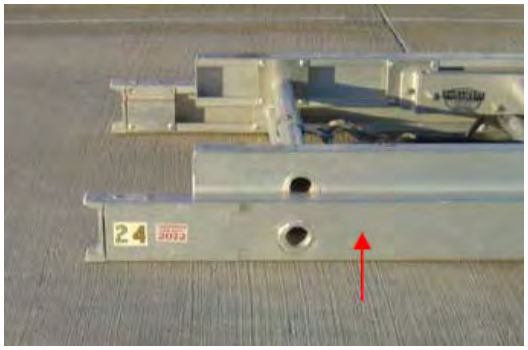
Tip: The extreme top of the ladder.

Base: Bottom or ground end of ladder (also known as butt or heel).
Shoes: Metal safety plates attached to the base of a ground ladder to stabilize the ladder and protect the beam ends (also known as heel plates or butt spurs).

Beam: One of two principal sides of a ladder.
Rungs: Cross members between the beams on which people climb.

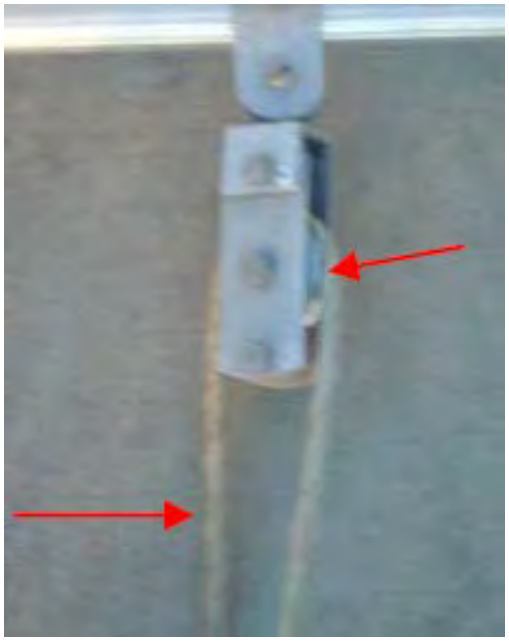


Main Beam: The principal beam of an extension ladder.

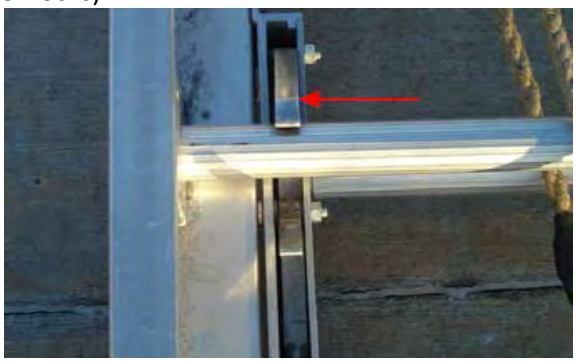


Gusset Plates: Plates which are attached to beams by rivets that are used to support rungs (also known as Truss Blocks).

Pulley: Small grooved wheel through which the halyard is drawn.
Halyard: Rope or cable used for hoisting fly sections.

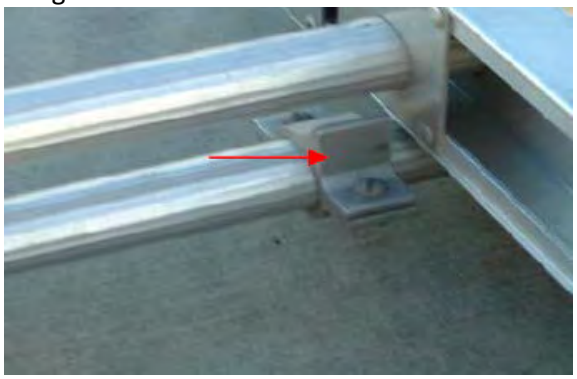


Dogs: Metal devices attached to the inside beams on fly sections of extension ladders. Dogs are used to hold the fly section in place after it has been extended (also known as pawls or locks).



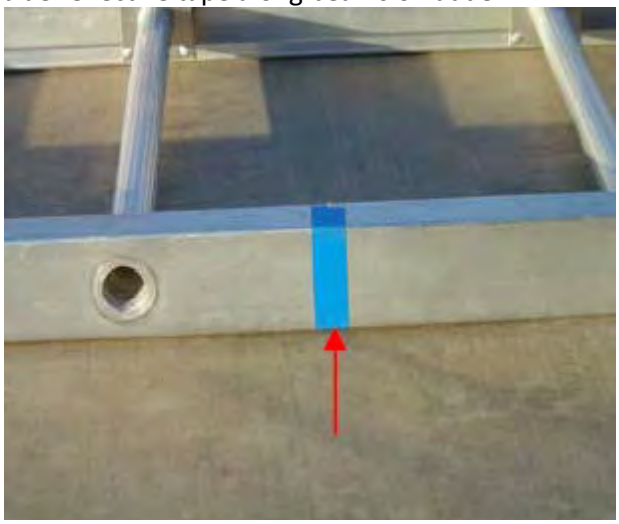
Guides: Metal strips on an extension ladder which guides the fly section and holds the fly to the main section while being raised; sometimes in the form of slots or channels.

Stops: Metal pieces which prevent the fly from being extended out of the main section.



Anchor: The part of the ladder which is used to attach the halyard to the ladder.

Balance Point: Point of a ladder where weight is distributed evenly. Balance point is marked with blue reflective tape along beams of ladder.



Fire Ladder Labels: One set/pair of Danger/Electrical/Angle labels are required for each ladder. The labels should be placed at the bottom of the ladder, outside the rail of the base section, both sides, between the 4th and 5th rung up from the bottom. Be sure the left label is placed on the left side, and the right label is placed on the right side. If placed on the wrong sides of the ladder, they will not make sense for ladder placement.

DANGER
FAILURE TO USE, UNDERSTAND, AND FOLLOW PROPER LADDER USAGE INSTRUCTIONS AS MADE AVAILABLE BY: DUO-SAFETY LADDER, N.F.P.A., I.S.F.S.I., A.N.S.I., O.S.H.A., ETC. COULD CAUSE SERIOUS INJURY AND/OR DEATH.
DANGER
FAILURE TO USE, UNDERSTAND, AND FOLLOW PROPER LADDER USAGE INSTRUCTIONS AS MADE AVAILABLE BY: DUO-SAFETY LADDER, N.F.P.A., I.S.F.S.I., A.N.S.I., O.S.H.A., ETC. COULD CAUSE SERIOUS INJURY AND/OR DEATH.
DANGER
WATCH FOR WIRES
THIS LADDER CONDUCTS ELECTRICITY
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CAUTION
OUT
CAUTION
OUT

Heat Sensor Labels: These are visual warning labels furnished on all aluminum and fiberglass ladders since January, 1984. These labels are heat sensitive materials that turn black if any heat is ever present that is greater than approximately 300 degrees F. The 300 degree F temperature is used because once aluminum fire ladder materials (6061-T6 alloy) reach this 300 degree F (even if only for a moment), the ladder material may have lost at least 25% of its load capacity. This heat exposure effect is not reversible in the ladder and can continue to accumulate over its entire life.

Ladder Basics – Commands & Communications

Purpose: To clearly define the ladder evolution language and communication that takes place while performing ground ladder operations. By standardizing the ladder language it is the intent that this will facilitate ladder operations and make for a safer, more consistent, and more efficient ladder evolution.

Responsibility: It shall be the responsibility of all members of the Henderson Fire Department who may be called upon to execute ground ladder operations to remain familiar with the ladder evolution language/ communication adopted.

Procedure: The Henderson Fire Department has identified the information contained within this document to be an integral part of the adopted ground ladder practices. This document contains the following information within its subsection(s).

Introduction

One of the most important factors in the smooth operation of ladders is the proper use of ladder commands. All personnel working with ladders should be familiar with the exact communication that takes place when executing a ladder evolution. Only one person will be tasked with issuing the ladder commands. The person at the base of the ladder will be the designated the **Ladder Commander.**

The ladder commands used by the Henderson Fire Department are:

1. "**Beam Ladder**"
2. "**Shoulder Ladder**"
3. "**Raise the Fly**"
4. "**Lower Ladder into Building**"
5. "**Remove Ladder from the Building**"
6. "**Lower the Fly**"
7. "**Reverse Ladder**"
8. "**Ground Ladder**"
9. "**Bed Ladder**"

Ladder commands are given in two parts:

1. Preparatory command
2. Execution command

Example: "Preparatory- "Prepare to beam ladder…" "Execution- "Beam Ladder…"

The Henderson Fire Department also uses standardized communications while executing ladder operations. These include:

1. "**Ladder coming through**"- safety order used to alert others on the fire ground that you are operating nearby with a ladder.
2. "**Beam raise or flat raise**"- informs partner which raise will be executed.
3. "**Fingers and toes**"- safety order for partner to check that hands and feet are clear from moving fly section.
4. "**Dogs locked**"- safety order telling ladder commander that the dogs have been secured.
5. "**3, 2, 1 building** – safety order used to notify base person how close the ladder tip is to making contact with the building."
6. "**Clear**"- safety order given to alert others that the ladder is coming down.

Ladder Basics – Types

Purpose: To provide members clear and concise definitions of the types of fire service ladders currently being used by the Henderson Fire Department.

Responsibility: It shall be the responsibility of all members of the Henderson Fire Department who may be called upon to execute ground ladder operations to remain familiar with the types of fire service ladders being utilized and carried on City of Henderson Fire Department apparatus.

Procedure: The Henderson Fire Department has identified the information contained within this document to be an integral part of the adopted ground ladder practices. This document contains the following information within its subsection(s).

Introduction: All of the various types of fire service ladders have a purpose. Although the primary use of fire department ladders is to provide firefighters a means of accessing upper floors of a structure, ladders are a versatile tool having many other uses.

Straight Ladders: A straight ladder is nonadjustable in length and it consists of one section. Its size is designated by the overall length of its beams. The straight ladder is sometimes called a wall or single ladder and it is used for quick access to windows and roofs of one and two story buildings.

Extension Ladders: An extension ladder is a ladder that is adjustable in length. It consists of two or more sections which travel in guides or brackets to permit length adjustments. Its size is designated by the length of the sections measured along the beams when fully extended. Extension ladders provide access to windows and roofs within the limits of their extendable length.

Roof Ladder: Roof ladders are straight ladders that are equipped with folding hooks at the tip. These hooks provide a means of anchoring the ladder over the roof ridge or other parts of the roof. Roof ladders are generally required to lie flat on the roof surface so that the firefighter may stand on the ladder for roof work. The ladder distributes the firefighter's weight and helps prevent slipping.

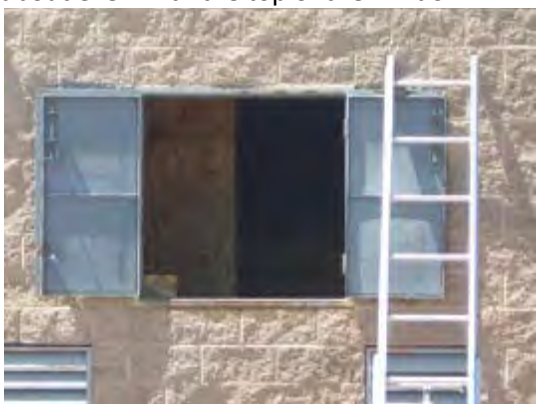
Attic Ladder: Attic ladders are straight ladders that have hinged rungs allowing them to be folded so that one beam rests against the other. This allows them to be carried in narrow hallways and used in attic scuttle holes, small rooms, and closets.

Combination Ladders: A combination ladder is adjustable in length and it also has suitable means for locking the sections together so that the two sections can form equal angles with the floor or ground as a step ladder. The size is designated by the length of the sections. This ladder is referred to as "The Little Giant Ladder" on the Henderson Fire Department.

Ladder Basics – Placement

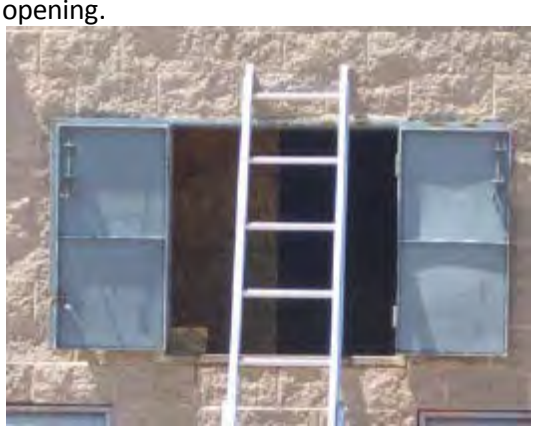
Purpose: The placement of ladders is determined by the intended use of the ladder and the positioning of if for safe and easy climbing.

Horizontal Ventilation: If the ladder is to be used by firefighters to effect ventilation from a window, it should be placed alongside the window, to the windward side with the tip about even with the top of the window.

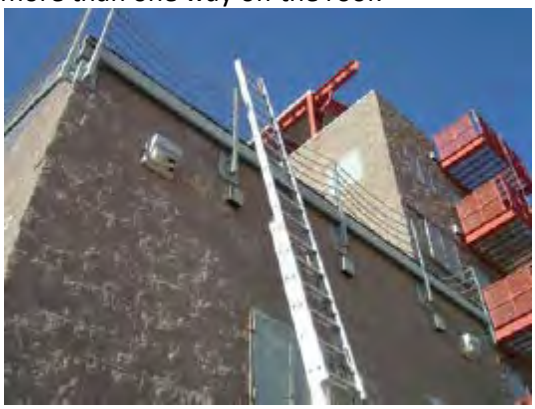


Rescue from a Window: If the ladder is to be used for rescue from a window, consideration must be given to the size of the window. Normally, the ladder tip is placed slightly below the window sill. Where the window opening is wide enough to permit placing the ladder inside the window opening and still leave room beside it to facilitate the rescue. It should be placed so that two or three rungs extend above the sill.

Fire Attack Through a Window- NO ENTRY: When a ladder is to be used as a vantage point from which to direct a hose stream into a window opening and entry is **not** to be made, it should be raised directly in front of the window with the tip on the wall above the window opening.



Roof Operations: On all structure fires where personnel will be working on the roof, at least two ladders should be placed to the roof. Preferably, these ladders should be placed at opposite ends of the fire so that there will be more than one way off the roof.



Safety Considerations for Ladder placement:

- Overhead obstructions such as wires, tree limbs, building overhangs, etc.
- Uneven terrain, sprinklers, gravel, etc.
- Bushes, parked cars, A/C units, pool equipment, etc.
- Main paths of travel that firefighters or evacuees may use.

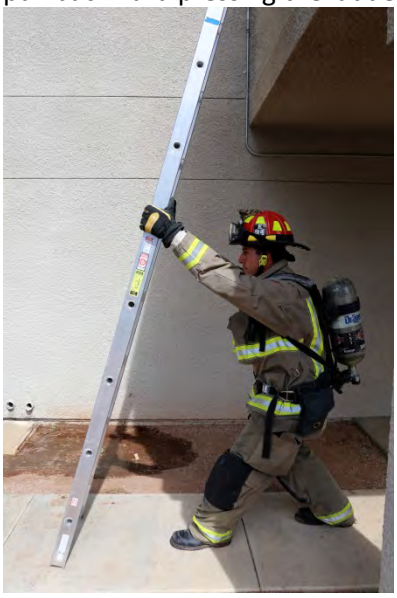
Climbing Angle:

- When ladders are raised into place, they should be at an angle that is safe and easy to climb.
- The distance of the base from the building establishes the angle formed by the ladder and the ground. If the ladder base is too close to the building, the ladder stability is reduced and when it is climbed, the tip of the ladder may be pulled away from the building.
- If the base of the ladder is too far from the building, the load carrying capacity of the ladder is reduced and the shoes may lose traction causing the ladder to slip down the side of the building.
- The Henderson Fire Department recognizes a climbing angle of 60-65 degrees as being safe for ascending, descending, and for firefighter self rescue from a structure.

Securing The Ladder – Footing

Introduction: A ladder is to be kept from slipping whenever a firefighter is climbing it- **no exceptions!** There are several methods employed by the Henderson Fire Department when footing a ground ladder. When securing a ladder, the firefighter must be wearing a helmet and gloves, and must not look up. Debris from the building or from the firefighters working area is always considered a hazard.

Method 1: Positions yourself beneath the raised ladder with your back toward the building. Stand with feet about shoulder width apart, span the beams of the ladder with both hands around eye level, and pull backward pressing the ladder against the building.



Method 2: In the second method of footing, the firefighter footing the ladder places the toes of one foot against the base of the ladder at the shoes. The hands span the beams and the ladder is pressed against the building.

Securing The Ladder – Tying The Halyard

Introduction: Before an extension ladder is climbed, the excess halyard should be tied to the ladder. This prevents the fly section from coming down, and avoids a potential trip hazard. The knot used is called a "Bangor Knot".

Task Benchmarks:

1. Find the center point of the excess halyard by pulling it to the rear of the ladder.
2. Wrap the excess halyard around two convenient rungs and pull it taught.
3. Using the halyard as a reference, divide the ladder into four equal "bays" at eye level. From the base person's perspective, number these bays clockwise from 1 to 4 starting at the top.
4. Person on rear side of the ladder takes a bite from the halyard and feeds it back to the person on the front side of the ladder from bay 3 to bay 1 pulling it taught.
5. Person on the rear of the ladder takes another bite of the halyard and feeds it to the person on the front side of the ladder through bay 3. Person on the front side of the ladder grabs the bite and feeds it back to person on rear of ladder through bay 2.
6. The bite is fed through the loop that the rear person has formed, and the halyard is cinched down forming the "Bangor Knot".
7. The excess halyard is secured by tying hitches around itself. **Remember: bays 3 to 1 and 3 to 2 will form the Bangor Knot. "31 32 Follow Through".**

1.

2.

3.

4.

5.

6.

7.

Climbing Ladders – General Technique

Introduction: Firefighters ascending or descending a ladder should make sure they do so as smooth as possible. This is accomplished when the climber keeps the knees bent and eases weight onto each rung. Attention should be focused on causing the least amount of bounce or sway when climbing the ladder. Climbing may start after the climbing angle has been checked and the ladder is properly footed. The firefighter climbing notifies the person footing the ladder that they are about to begin climbing by saying: **"On Ladder".**

Climbing Technique: As the firefighter ascends the ladder, eyes should be focused straight forward with an occasional glance toward the destination. The firefighter's arms should be kept straight during the climb which will help keep the body away from the ladder. The hands should grasp the rungs with palms down and thumbs beneath the rung. The climb should be done smoothly and rhythmically with all upward progress being accomplished by the leg muscles, not the arm muscles. The arms and hands should not reach upward during the climb. Reaching upward will bring the climber's body too close to the ladder. Once the firefighter reaches the destination and dismounts the ladder, notify the person footing the ladder by saying: **"Off Ladder".**

Climbing Ladders – Working on a Ladder

Introduction: Whenever firefighters must perform work from a ground ladder they are to secure themselves to the ladder by using a leg lock. The Henderson Fire Department refers to this leg lock as "locking-in".

Technique: To lock-in on a ladder, the firefighter climbs to the desired height of the ladder. Then stands with both feet on a common rung and raises the opposite leg to the side the work will be on. This leg is lifted over the second rung from the common rung that the firefighter is standing on, and placed through that rung bay. The leg is then brought back through the ladder just below the rung that is supporting the knee. This foot is then wrapped around the top side of the beam. The other foot is placed against the opposite beam for stability. The firefighter is now locked in to the ladder and is able to work hands free.

Note: Individual body mechanics and body structure will dictate exactly how a firefighter will accomplish the lock-in. A firefighter with long or short legs may need to alter this procedure for safety and comfort.

Ladder Evolutions – One Person

The Henderson Fire Department has identified the information contained within this document to be an integral part of the adopted ground ladder practices. This document contains the following information within its subsection(s).

One Person Low Shoulder- Carry & Raise
One Person Low Shoulder- Lowering
One Person High Shoulder- Carry & Raise
One Person High Shoulder- Lowering

Lifting to Carry: When lifting ladders from the ground or off the apparatus, proper lifting techniques must be utilized to prevent back injuries. Always ensure you are using leg, arm, and shoulder muscles while keeping your back straight.

Ladder Evolutions – One Person Low Shoulder Carry & Raise

Task Benchmarks:

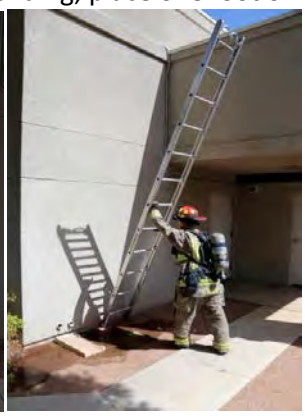
1. *From the grounded position*: face opposite the direction of travel at the balance point of the ladder. Usually, this will mean facing the tip of the ladder.
2. Crouch down next to the ladder with the outside foot forward, back straight, and head up. Using the inside hand grab the beam at the balance point of the ladder.
   a.
3. Lift the ladder from a flat position onto its beam.
   a.

4. Reposition body next to the ladder with the inside hand grabbing the beam at the balance point.
   a.

5. *With the ladder in a beamed position:* lift the ladder from the ground and rotate body 180° placing the outside arm through the rungs at the balance point. Firefighter will now be facing the base of the ladder.

6. Prior to advancing ladder, ensure that the inside arm is extended straight out with the inside hand grabbing the bottom beam. The rung shall be tucked securely against the body. The outside arm is extended with the outside hand grabbing the top beam of the ladder. For safety to others, carry the ladder with the base below eye level.
    a.
7. Carry the ladder toward the objective. While advancing, look up to identify any potential overhead hazards including wires, trees, etc. Also, look down to identify any potential trip hazards including sprinklers, curbs, uneven terrain, etc.
8. While approaching the objective, place the outside hand, thumb down, on the rung in front of the inside shoulder, with hand all the way at top of the rung.
9. Shift inside hip against the lower beam of the ladder.
10. While in this position, pass inside arm through rung bay and grab the rung that is against the inside shoulder with the inside hand, thumb up and hand all the way at the bottom of the rung.
    a.

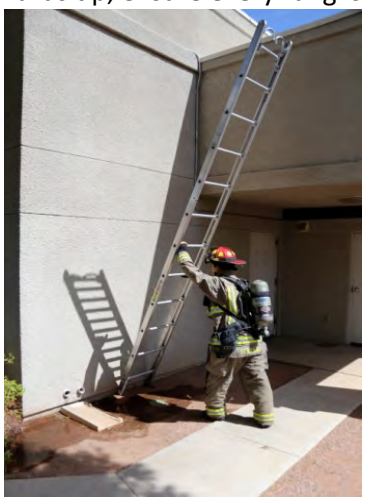
11. If needed, use inside hip to "pop" the ladder up and away from the body while simultaneously raising inside arm until ladder is in a flat position. Shift the ladder forward until the ladder is resting on the upper most part of the shoulder and dip the base toward the ground.
    a.

12. As the ladder base contacts the building at ground level, slightly squat down with the knees. As the knees are straightened, push the ladder off the shoulder and continue to raise the ladder to vertical. Make sure to grab the center of the rungs as it is being raised into the building. Once the tip of the ladder contacts the building, place one foot on the center of the bottom rung.
    a. 
13. To position the ladder at a proper spot and climbing angle: Place one hand high on the beam and the other hand low on the center of the most convenient rung (bottom hand palm up). Lift the ladder clear of the ground and pull the base away from the building to adjust for proper spot and climbing angle.
    a.
14. Squat down with the knees and secure the ladder.
    a.
15. Ladder is now ready for use.

Ladder Evolutions – One Person Low Shoulder Lowering

Task Benchmarks:

1. *To lower the ladder flat*: place one hand high on the beam and the other hand low on the center of the most convenient rung (bottom hand palm up). Lift the ladder clear of the ground and push the base against the building. As the base contacts the building place one foot on the center of the bottom rung.
   a.
2. Check to ensure the area needed for lowering ladder is clear. The area directly above the tip will also be checked. Firefighter will indicate the area is clear by shouting "All Clear".
   a.

3. Begin lowering the ladder by placing hands on center of most convenient rungs while walking back towards tip; ensure every rung is contacted and that no rungs are skipped.
    a. 
4. Once the balance point is reached, pivot body 180° while simultaneously placing free arm through rung bay. Allow the top beam to come to rest on inside shoulder. Firefighter will now be facing the direction of travel and the tip of the ladder.
    a.

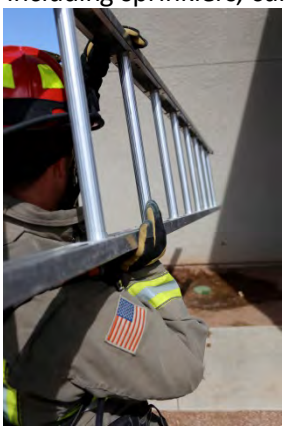
Ladder Evolutions – One Person High Shoulder Raise

Task Benchmarks:

1. *From the grounded position*: face opposite the direction of travel at the balance point of the ladder. Usually, this will mean facing the tip of the ladder.
2. Crouch down next to the ladder with the outside foot forward, back straight, and head up. Using the inside hand grab the beam at the balance point of the ladder.
   a.
3. Lift the ladder from a flat position onto its beam.
   a.

4. Reposition body next to the ladder with the inside hand grabbing the beam at the balance point.
   a.

5. *With the ladder in a beamed position:* lift the ladder from the ground and rotate body 180° placing inside hand beneath the bottom beam at shoulder level. Rest the bottom beam of the ladder on the hand not directly on the shoulder. Grasp the top beam of ladder with the outside hand making sure it is positioned slightly forward in relation to the inside hand. If the top beam cannot be reached comfortably by the outside hand, it is permissible to grasp a rung.
   a.

6. Carry the ladder toward the objective. While advancing, look up to identify any potential overhead hazards including wires, trees, etc. Also, look down to identify any potential trip hazards including sprinklers, curbs, uneven terrain, etc.
    a. 
7. When desired spotting point is reached, lower the base of the ladder, bend at the knees and dip making sure back is straight and head is up. Plant the bottom beam ladder spur into the ground.
    a.
8. Push ladder off the shoulder with inside hand and arm while simultaneously straightening legs.
    a.

9. Once the ladder is raised to a vertical position, ensure the ladder is steady and rotate the ladder if necessary by footing a beam and rotating.
    a.
10. Place a foot on the center of the bottom rung, span the beams at eye level making sure both hands are up against beams and lower the ladder into the building.
    a.
11. To position the ladder at a proper spot and climbing angle: Place one hand high on the beam and the other hand low on the center of the most convenient rung (bottom hand palm up). Lift the ladder clear of the ground and pull the base away from the building to adjust for proper spot and climbing angle.
    a.

Ladder Evolutions – One Person High Shoulder Lowering

Task Benchmarks:

1. *To lower the ladder on a beam*: Place a foot on the center of the bottom rung and span the beams at eye level with both hands.
   a.
2. Call "All Clear" prior to pulling the ladder away from the building. Using a counter balance of bodyweight, pull the ladder tip away from the building until it reaches vertical.
3. Once the ladder is vertical, rotate the ladder if necessary by footing a beam and rotating the ladder 180°.
   a.
4. Place hand on the beam balance point or as close to it as possible. Span the opposite beam with other hand. Step beneath what will become the bottom beam and call "All Clear". Let the ladder fall onto shoulder while simultaneously bending at the knees and dipping, allowing the ladder to come to rest at shoulder level **(Keep back straight and head up)**, straighten legs, and come to a standing position. Carry the ladder as prescribed.
   a.

Ladder Evolutions – Two Person

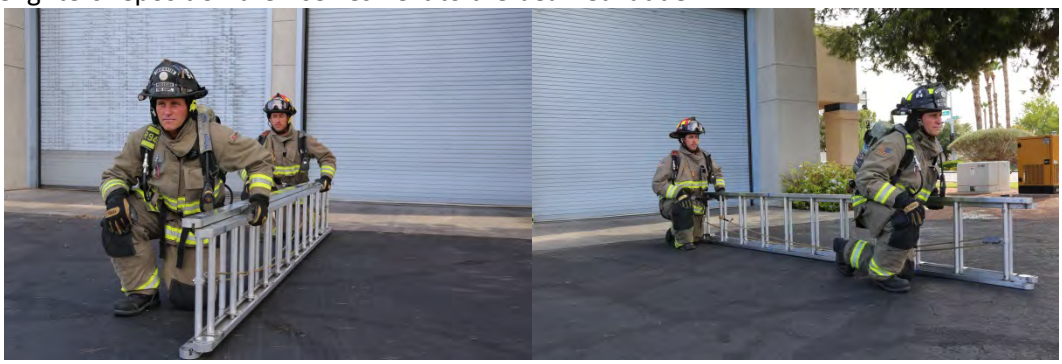
The Henderson Fire Department has identified the information contained within this document to be an integral part of the adopted ground ladder practices. This document contains the following information within its subsection(s).

Two Person Low Shoulder- Carry
Two Person Low Shoulder- Flat Raise/Beam Raise
Two Person Low Shoulder- Lowering on a Flat/Beam

Note: The Henderson Fire Department Follows the IFSTA recommendation of one Firefighter per fly section.

Ladder Evolutions – Two Person Low Shoulder Carry & Flat Raise

Task Benchmarks:

1. Both firefighters face opposite direction of travel. B**ase person** at base, T**ip person** at tip.
2. Both firefighters crouch down next to the ladder at second rung bay with outside foot forward, back straight and head up.
   a.
3. On command from base person, both firefighters lift ladder from a flat position onto its beam. **Preparatory command: "Prepare to beam ladder". Execution command: "Beam Ladder".**
4. Both firefighters reposition themselves next to the beamed ladder.
   a. 
5. On command from the base person, both firefighters lift the ladder from the ground, pivot 180° and place outside arm through the second rung bay at both the tip and base. Both firefighters should have inside arms through second rung bay with rung pulled tightly against body and arm fully extended grabbing bottom beam. **Preparatory command: "Prepare to low shoulder ladder". Execution command: "Shoulder ladder".**
   a.

6. Carry the ladder toward the objective. While advancing, look up to identify any potential overhead hazards including wires, trees, etc. Also, look down to identify any potential trip hazards including sprinklers, curbs, uneven terrain, etc.
    a.
7. While approaching objective, **base person** calls out **"Flat Raise"**. At this point, **tip person** withdraws arm from the second rung bay and lifts the ladder to a high shoulder position with inside hand grabbing the third rung from tip, and hand in a thumbs down position. **Tip person** then acknowledges and calls **"Flat Raise Ready"**.
    a.
8. **Base person** supports the ladder with outside hand by reaching across body and grabbing the top beam while covering spurs. **Base person** withdraws inside arm from the second rung bay and positions inside hand to grab the top beam. **Base person** lets go of spurs with outside hand and lets inside arm drop to full extension. The **base person** is now in a suitcase position/carry.
    a.

9. When the spotting point is reached, **base person** steps with the inside foot forward and plants the ladder spur into the ground.
    a.
10. **Base person** foots ladder with inside foot by stepping on spur while simultaneously rotating 180° while flipping ladder away from body using left hand (fly section on the outside). **Base person** then transitions right foot from the spur onto the bottom rung. Then places left foot on bottom rung, and begins to stand up and "ride rung" as the ladder is being raised to vertical. **Base person** can place hands on convenient beams or rungs.
    a.

11. **Tip person** simultaneously raises the ladder over head and begins walking the ladder tip up ensuring every rung is contacted until ladder is vertical.
    a.
12. As the ladder reaches a vertical position, **base person** steps off the bottom rung and moves into a “big X”. **Tip person** moves into “big X” following **base person.**
    a.
13. **Base person** grabs the halyard with both hands, thumbs down and elbows out, then raises the fly section to desired height, and locks dogs.
    a.

14. On command from **base person,** the **tip person** spans beams with both hands and places a foot on center of bottom rung. **Base person** spans beams with both hands and takes a step back towards objective.
    a.
15. **Tip person** guides the ladder into objective. **Preparatory command: "Prepare to lower ladder into building". Execution command: "Lower ladder into building".**
    a.
16. Ladder is tied off as prescribed.

Ladder Evolutions – Two Person Lowering Flat

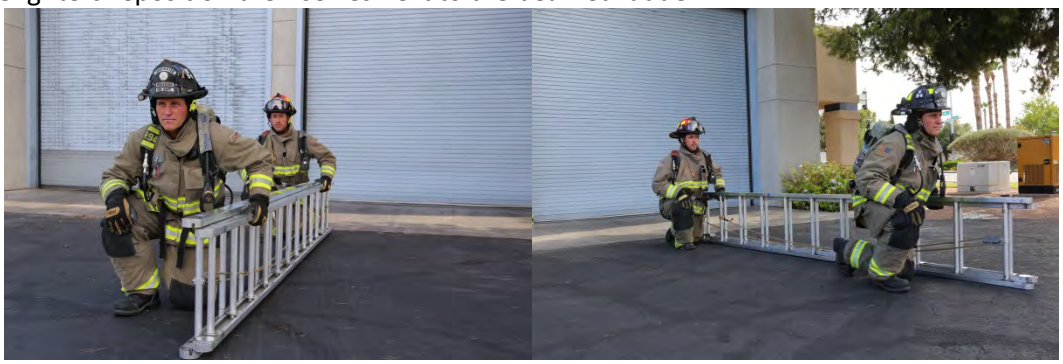
Task Benchmarks:

1. Prior to pulling the ladder away from the building, **base person** calls **"All Clear"**. On command from **Base person, tip person** spans beams with both hands and places a foot on the center of bottom rung. **Base person** spans beams and takes a step forward while pushing the ladder away from the objective until ladder reaches vertical. **Preparatory command: "Prepare to remove ladder from building". Execution command: "Remove ladder from building".**
   a.
2. **Base person** grabs the halyard with both hands, thumbs down elbows out, and lowers the fly section until fully retracted, and locks the dogs.
   a.
3. **Base person** calls **"All Clear"** places both feet on the bottom rung, grabs convenient rung/beams with both hands, and begins to lower ladder while pulling back to take as much weight as possible from the **tip person.**
   a.

4. **Tip person** lowers the ladder hand over hand making sure to contact every rung until reaching the second to last rung at the tip.
    a.
5. **Tip person** brings the ladder to shoulder and holds free arm out horizontally while still facing the base. This acts as a signal to the **base person.**
6. **Base person** steps to side of the ladder as directed by **tip person's** arm signal, grabs the outside beam with inside hand and lifts the ladder onto its beam. **Base person** then places outside hand on third rung from base with thumb against the top beam and lifts ladder. **Base person** then places inside arm through the second rung bay from the ladder base.
    a.
7. As the **base person** lifts ladder, the **tip person** rotates 180° and places free arm through second rung bay from the tip. Firefighters carry ladder as prescribed.
    a.

Ladder Evolutions – Two Person Low Shoulder Carry & Beam Raise

Task Benchmarks:

1. Both firefighters face opposite direction of travel. B**ase person** at base, T**ip person** at tip.
2. Both firefighters crouch down next to the ladder at second rung bay with outside foot forward, back straight and head up.
   a.
3. On command from base person, both firefighters lift ladder from a flat position onto its beam. **Preparatory command: "Prepare to beam ladder". Execution command: "Beam Ladder".**
4. Both firefighters reposition themselves next to the beamed ladder.
   a. 
5. On command from the base person, both firefighters lift the ladder from the ground, pivot 180° and place outside arm through the second rung bay at both the tip and base. Both firefighters should have inside arms through second rung bay with rung pulled tightly against body and arm fully extended grabbing bottom beam. **Preparatory command: "Prepare to low shoulder ladder". Execution command: "Shoulder ladder".**
   a.

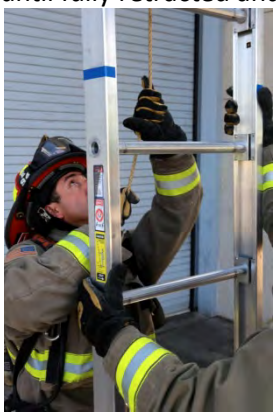
6. Carry the ladder toward the objective. While advancing, look up to identify any potential overhead hazards including wires, trees, etc. Also, look down to identify any potential trip hazards including sprinklers, curbs, uneven terrain, etc.
   a.
7. While approaching objective, **base person** calls out **"Beam Raise"**. At this point, **tip person** withdraws arm from the second rung bay and lifts ladder to a high shoulder position with inside hand grabbing the bottom of main beam and outside hand supporting ladder by holding the top beam. **Tip person** then acknowledges and calls **"Beam Raise Ready".**
   a.
8. **Base person** supports the ladder with outside hand by reaching across body and grabbing top beam while covering the spurs. **Base person** withdraws inside arm from second rung bay and positions inside hand to grab the top beam. **Base person** lets go of spurs with outside hand and lets inside arm drop to full extension. **Base person** is now in a suitcase position/carry.
   a.

9. When spotting point is reached, **base person** steps with inside foot forward and plants the spur into the ground. **Base person** foots bottom beam with inside foot and raises the ladder keeping the top beam tight against inside knee.
    a.
10. **Base person** continues to foot the bottom beam with foot at right angle to beam. **Base person's** left hand continues to remain in contact with the beam while applying downward pressure to help keep the ladder stabilized. **Base person's** right hand also remains in contact with underside of top beam while pulling up on the beam to assist in raising ladder.
    a.
11. **Tip person** raises the tip over head with both hands, shifts hand on top beam to a position beneath bottom beam and continues raising ladder hand-over-hand on the bottom beam.
    a.

12. When the ladder is vertical, **base person** removes foot from beam, moves into base position creating a "big X." **Tip person** moves into tip position and also moves into "big X."
    a.
13. **Base person,** grabs the halyard with both hands thumbs down and elbows out, raises the fly to the desired height, and locks dogs.
    a.
14. On command from **base person, tip person** spans beams with both hands and places a foot on the center of the bottom rung. **Base person** spans beams with both hands and takes a step back towards objective. **Tip person** guides the ladder into the objective. **Base person** states **Preparatory command: "Prepare to lower ladder into building". Execution command: "Lower ladder into building".**
    a.
15. Ladder is tied off as prescribed.

Ladder Evolutions – Two Person Low Shoulder Lowering on a Beam

Task Benchmarks:

1. Prior to pulling ladder away from building, **base person** calls **"All Clear"**. On command from **Base person, tip person** spans the beams with both hands and places a foot on the center of bottom rung. **Base person** spans beams and takes a step forward while pushing ladder away from objective until ladder reaches vertical. **Preparatory command: "Prepare to remove ladder from building". Execution command: "Remove ladder from building".**
   a.
2. **Base person** grabs the halyard with both hands, thumbs down elbows out, and lowers fly section until fully retracted and locks dogs. Firefighters pivot ladder if necessary.
   a. 
3. **Base person** calls **"All Clear"** and then foots the beam that the ladder will be lowered on. **Tip person** grabs both beams of the ladder for balance.
   a.

4. **Tip person** places both hands beneath the bottom beam as the ladder is lowered. B**ase person** grabs the top beam with both hands and pulls the ladder back to offset its momentum, while keeping the top beam tight against knee.
   a.
5. **Base person** stops **tip person** at the second rung bay from the tip by calling **"tip person high"**. **Tip person** then brings the ladder to a high shoulder position.
   a.
6. **Base person** steps to the side of the ladder, places outside hand on third rung from base with thumb against top beam and lifts the ladder. **Base person** then places inside arm through the second rung bay from the base.
   a.

7. As **base person** lifts the ladder, **tip person** drops the ladder into a low shoulder carry, and rotates 180° and places outside arm through the second rung bay. **Tip person** is now facing the tip of the ladder. Firefighters carry the ladder as prescribed.
   a.

Ladder Care & Maintenance

The Henderson Fire Department has identified the information contained within this document to be an integral part of the adopted ground ladder practices. This document contains the following information within its subsection(s).

Aluminum Ladders General Information
Care and Maintenance
Care and Maintenance- Special Types of Ladders

The Henderson Fire Department uses heat treated aluminum 6061-T6 alloy ground ladders. Three principal reasons for using aluminum are: it is light weight, has adequate strength, and it permits for an accurate and reliable visual inspection of all ladder parts.

There is one major disadvantage in using aluminum for fire department ground ladders. Aluminum is an excellent conductor of electricity, which poses a great risk to firefighters working with ladders around overhead wires. Extreme caution must be used whenever ladders are being operated around electrical power sources.

Care and Maintenance
The proper care and maintenance of fire department ground ladders is imperative to their longevity, ease of handling, and reliability. Regular and proper cleaning of ladders is more than a matter of appearance. Dirt, road dust, or debris from a fire can collect on a ladder and make the ladder sections, hooks, pulleys, etc. inoperable. They should be cleaned and inspected after each use and pulled off of the apparatus every Monday to be inspected and/or cleaned.

Tested, cleaned, and maintained ladders last longer. Properly lubricated ladder sections slide easier and simply work better. No ladder should require more than a 75 lb. pull to raise any section. If you have any ladder in service that seems to require more than a 75 lb. pull to raise, immediate cleaning and waxing of all contact surfaces and lock parts should take place.

All stops, dogs, halyards, rivets, pulleys, and all moveable parts should be examined. The moveable parts should be lubricated every six months. The old lubricant should be removed with a solvent prior to applying the new one.

DUO-SAFETY LADDER suggests plain old candle wax or paraffin wax as your best lubrication. This wax coats and works into the pores of the ladder material and does not easily wash away with frequent water baths. This candle wax is also not costly and is readily available anywhere. It is suggested that you extend the ladder, and simply rub the candle wax over and onto all of the contacting parts.

CLEANING: Mild soap (ex: Ivory dish soap) and water works well - be sure to flush inside the rails and rungs to clear them of road salts, etc. We suggest a plastic scrub pad to buff the surface to a smooth finish. Be sure to **clean** and **rewax** the slide areas at the same time.

Be sure to check any heat sensor labels as you clean and wash the ladder. Try not to wash away the labels. **NOTE:** Use of harsh soaps or chemicals can sometimes turn heat sensor labels dark that is why mild soap is recommended for cleaning.

RAILS AND RUNGS: Aluminum is a malleable metal and is subject to dents and nicks, etc. **NOTE:** Small dents and/or nicks on the beams and rungs are not uncommon and are not grounds to fail a ladder. Be sure to record the location and size for future reference.

If there is ever any question or concern about any major dent(s) or other damage, the ladder should be removed from service and load tested. Be sure the rungs are all tight as the rung to rail joint is the only thing that holds the two beams together. If any rung is loose - remove the ladder from service, have it repaired and service tested before further use.

Care and Maintenance- Special types of Ladders

ROOF HOOKS: Fire service roof ladders are supplied with spring loaded, directionally swiveling and locking hook assemblies capable of 1,000 lb. load per hook/2,000 lb. load per pair. The roof hooks normally only require occasional cleaning to maintain proper operation - mild soap and water works well

FOLDING LADDERS: Maintenance is again the same as the general maintenance covered earlier. Mild soap and water works well for cleaning purposes. Ensure you check the rung assembly rivets regularly to be sure they are not worn excessively.

A-FRAME/COMBINATION LADDERS- LITTLE GIANT LADDER: Be sure to inspect the hinge hardware and fasteners. A few drops of any type of oil works well on the hinges and of course, soap and water works well on all the other parts. Be sure to check the spreader arms, bars and parts to be sure everything still works and fits together properly. These parts are vital in the A-frame position and must be able to properly engage before the ladder would be safe to use in the A-frame position.

Chapter

6

Equipment Guidelines

The purpose of the Henderson Fire Department Equipment Guidelines is to provide a standardized series of documents to guide department members in the safe, consistent use and maintenance of fire ground equipment and tools. The guidelines define the standardized use that shall be adopted by all Fire/Rescue Operations Personnel. The safe use of all equipment contained in the Equipment Guidelines shall be in conjunction with already established department Standard Operating Procedures, Task Standards, and Administrative Directives.

Chapter

6

Equipment Guidelines Table of Contents

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- EG-02 *SCBA*
- EG-03 *TIC*
- EG-04 *Ground Ladders*
- EG-05 *Hand Tools maintenance*
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Firefighter Equipment Guideline – **01**

Motorola XTS 5000R Portable Radio

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the *Motorola* XTS 5000R portable radio, as well as assure continued monitoring and operation of portable radios.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

PTT: Push To Talk button is the large black button on the left side of the radio

Soft Keys: The three dot soft keys, also known as the menu select buttons select the function shown over them on the display

Emergency Button: The emergency button is the orange button located at the base of the radio antenna. Depressing the emergency button will alert Control and give you priority sending your radio traffic.

Operations:

- Effective communication is critical for the safety and success of our personnel while delivering emergency services to our community. Effective on scene communication provides the connection between the Strategic level IC, the Tactical level Division/Groups, and the Task level of the workers. In order to standardize and clarify the communications process the following procedures will be followed per HFD **SOP EM-38 Communications.**
- Personnel shall carry and monitor their radio at all times when out of the station.
- Fire Administration shall monitor as needed. All portable radios are to remain as issued.
- Alterations and accessories must be approved by the Logistics Chief.
- Radios must be turned off during battery removal and installation, according to the manufacturer's instructions.
- In the event a portable radio has been immersed or extensively exposed to water (or any other liquid), the unit should be turned off and the battery removed immediately to stop corrosion to the circuits (see Item I.)
- Portable radios and/or its accessories damaged or not working properly shall be reported to the on duty Battalion Chief for replacement.

- If a radio and/or its accessories is lost or stolen, it must be reported immediately to the on duty Battalion Chief. An official report must be completed. Once the radio and/or accessories have been replaced by the Battalion Chief the equipment will be turned over to the Logistics Division Chief for replacement or repair.
- The 800 mhz fleet maps shall be kept current by the Logistics Division and can be found by contacting them.

General Requirements

- Standard Language: Clear text will be used. Codes will be avoided if possible.
- Radio Communication Techniques: Before transmitting know what you are going to say. Personnel must use a calm clear voice. Speak slowly and position your mouth 1-3 inches away from the radio.
- Be concise: Only utilize radio traffic for pertinent information. Prioritize your messages. Do not use up valuable air time with unimportant messages and insignificant details.
- Transmit critical messages first. Do not interrupt unless you have "Emergency Traffic".
- Radio Communication Format: The HFD will utilize the "Hey you, it's me" format.
- Order Model: Along with the "Hey you it's me" format, the Order Model will also be followed. The Order Model states that before a message is sent the receiver must indicate they are ready to listen, and then after it is given they must briefly restate the message to insure clarity.
- Radio Etiquette: A professional and courteous demeanor will be maintained during radio communication. Foul language, sarcasm, insults and horseplay will not be allowed. The primary channels of Z7 B9 and TAC 3 will not be utilized for any communication outside of emergency operations and official fire department business.

Radio Channels

- HFD primary dispatch/communication channel is Zone 7 Battalion 9
- Zone 7 Tac 3 will be the first tactical channel utilized for significant incidents.
- All units dispatched on first alarm assignments will be advised to switch to Z7 Tac 3.
- The IC or dispatch can request to switch communications to Z7 Tac 3 on any incident that is escalating and creating communication difficulty on the primary channel.
- The additional Tactical Channels that can be utilized by the IC are: Tac 4 – 9.
- Zone 7 Battalion 9 is the main channel to be monitored by on-duty personnel.
- All Fire/Rescue Operations personnel assigned a portable radio shall monitor radio transmissions from 0700 until 2100.

Maintenance Procedures

Battery

- Batteries have an 8 hour battery life
- Change batteries daily each morning
- Clean radio with department approved cleaners

Equipment Specs

Motorola XTS 5000R

- Frequency band: VHF, UHF, 700 MHz, and 800 MHz capable
- Battery: Nickel Cadmium with 8 hour life
- Weight: 21.6 oz
- 1000 channel capability
- Adheres to military specs 810 C, D, E, F allowing resistance to drops, vibrations, shock, and static electricity.
- IP54: Submersible and dust protected

Firefighter Equipment Guideline – **02**

Dräger Self-Contained Breathing Apparatus (SCBA)

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the SCBA. It is the policy of the Henderson Fire Department that all personnel expected to, or likely to, respond to and function in areas of atmospheric contamination will be equipped with and trained in, the proper use and maintenance of the self-contained breathing apparatus.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

PASS: The Personal Alert Safety System is a device that emits a loud alert or warning that the wearer is motionless.

HUD: The Heads-Up Display found in the face mask provides a visual display of air cylinder PSI through the use of green, yellow, and red lights.

Sentinel: The Dräger 7000 utilizes the Sentinel 7000 as a fully integrated pressure gauge, smart electronic monitoring device, and PASS device providing real time information about the SCBA to the user every 30 seconds.

Lung Demand Valve: The Lung Demand Valve (LDV) also known as the second stage regulator completes the connection between the SCBA and face mask, and further reduces the high pressure to positive pressure slightly above atmospheric pressure.

Responsibility: Members are responsible for checking their SCBA and PASS alarm on a daily basis and after every use. Spare SCBAs are the responsibility of the unit Driver/Engineer. All personnel shall be familiar with the proper methods of cleaning all SCBA components in accordance with manufacturer's policies.

Safety Operations

- SCBAs will be worn by all Fire/Rescue Operations personnel entering an IDLH or potentially IDLH atmosphere and/or when determined by the officer in charge. The SCBA will NOT be removed after the fire is extinguished until the officer in charge determines the structure is clear of smoke and toxic products.
- All personnel will exit the hazardous environment before the point at which remaining operation time of breathing apparatus equals the time necessary to return safely to a nonhazardous environment.
- Face mask fit testing will be conducted in accordance with OSHA 1910-134.

- Personnel who must wear glasses while using SCBA shall have their face mask equipped with a spectacle kit.

Task Benchmarks

Donning Procedure

- Perform a proper Daily Check prior to donning the SCBA.
- The process to don the SCBA shall be in accordance with HFD **IPS-02 Donning SCBA** Task Standard.

Maintenance Procedures

General

- The SCBA is the most critical piece of firefighting equipment used.
- The SCBA shall be inspected for defects daily, immediately after use, and weekly (Monday) in accordance with manufacturer's guidelines.
- Utmost care shall be exercised in the maintenance, cleaning, storage, and handling.
- Repairs by members are limited to the replacement of voice amplification and heads-up display batteries.
- All other repairs or adjustments must be done by the HFD Equipment Technician.

SCBA Face Mask

- Check the face mask head straps/head harness for cuts, pliability, and integrity.
- Inspect the face mask lens for cracks or large scratches.
- Ensure the lens and second stage regulator connection is free of dirt and dust.
- Ensure the *HUD* connection when turned on and lights illuminate appropriately.
- Check that the voice amplifier works with full battery.

SCBA Air Cylinder

- Check the exterior of the cylinder for nicks, cuts, gouges, and heat damage.
- Check air pressure indicators on each side of the cylinder valve.
- The PSI should read within 500 PSI of each other.
- If the air cylinder gauge reads less than 4000 PSI as indicated on the *Sentinel*, replace with a fully pressurized cylinder.

SCBA Harness and Backplate

- Check straps, harness, padding, buckle and backplate for damage, cracks, defective buckle.
- Ensure proper backplate height adjustment.
- Ensure shoulder and waist straps are in a position of readiness.
- Ensure central battery pack is connected.

Sentinel 7000

- Check for *Sentinel* activation when system is pressurized.
- Check battery life: Visual check of battery life on bar graph during initial start up.
- Change battery pack in back plate if below 50% battery life.
- Check digital pressure readout for accuracy.
- Check for *PASS* alarm and full alarm activation is functioning properly with both visual and audible alarms.
- Ensure 50% and 25% alarms sound as system pressure is relieved.

Regulator, Hoses, and Buddy Breathing Connection

- Check hoses for holes, cuts, tears, rust or corrosion.
- Check quick connect couplings for proper function.
- Check second stage regulator (*LDV*) for damage or cracks to housing. Check knobs and buttons for proper operation. Test connection and release from face mask.
- Check buddy breathing fittings for leaks while pressurized, caps in place and hose stored correctly.

Dräger SCBA Daily Check

- SCBA should be in front of you, out of apparatus mounting bracket.
- Check air cylinder pressure. Pressure should not be lower than 4000 PSI.
- Check for proper connection of the cylinder to the first stage regulator quick connect.
- Open air cylinder valve slowly and listen for audible whistle as system is pressurized. The *Sentinel* will also flash/audiblize.
- Check battery life and digital pressure readout on *Sentinel.* Match pressure gauge on cylinder and *Sentinel.*
- Don face mask and ensure *HUD* activation.
- Check second stage regulator shut off button is depressed, and bypass valve is off.
- Attach *LDV* to face mask and try to pull it out.
- Perform a negative pressure test.
- Ensure first breath on activation provides positive pressure with no excessive free flow of air past the face mask.
- Check proper bypass function.
- Hold breath and listen for mask leak.
- Depress shut off button and remove *LDV* from mask and replace in holster.
- Close air cylinder valve and observe *Sentinel* digital pressure readout for any drop in pressure.
- Slowly open the bypass valve to bleed the system. As the pressure drops observe the *Sentinel* to ensure the alarms function at 50% and 25% of air cylinder pressure as well as audible whistle from the first stage regulator when cylinder reaches less than 25% PSI.
- Hold at 500 – 1000 psi and listen for continuous EOST alarms, then bleed pressure to 0 PSI.
- Wait 30 seconds for Full PASS alarm activation. Reset alarm, and then check manual PASS activation.
- Check harness and backplate and reset shoulder and waist straps for readiness.
- Secure SCBA to bracket.

Cleaning/After Use Care

- If the SCBA is still serviceable, steps must be taken to ensure readiness prior to placing it back on the apparatus.
- Face mask
    - Rinse mask in water after each use
    - Use baby soap if further cleaning is needed
    - ***WARNING!***: AIR DRY ONLY, NO COMPRESSED AIR.
- SCBA Pack
    - Ensure the *LDV* is in its holder with doffing button depressed.
    - Ensure the cylinder is attached to first stage regulator and back plate.
    - Use cool water and baby soap as needed.
    - Air dry.
    - Perform a Daily Check.
    - Perform a High Pressure Leak Test.

Weekly (Monday) Check

- Perform a Daily Check
- Perform a High Pressure Leak Test
    1. Ensure cylinder is off, doffing button is depressed and no pressure is in the lines.
    2. Press the left button on the Sentinel.
    3. When the high pressure leak test icon is displayed press the left button again.
    4. Open cylinder valve when icon is displayed.
    5. Close cylinder valve when icon is displayed.
    6. Press right button.
    7. After test pass through icon is displayed press right button.
    8. Test complete.
- If the pack does not pass retest, if it does not pass a second time, place the pack out of service.

Equipment Specs

Dräger PSS 7000 SCBA

- Advanced compression-molded comfort padding
- Carbon fiber composite back plate
- Three height adjustments
- 10 second air cylinder quick connect/disconnect
- Sentinel 7000 provides real time information to the user every 30 seconds
- Both the Dräger PSS 7000 SCBA and the Sentinel 7000 are powered by one central quick change battery pack system with five AA batteries, with an additional CR-123 backup battery
- Utilizes 4500 PSI high pressure 45 min. bottle

References

- Equipment Operations Handbook, Chapter 3 *SCBA*
- Dräger PSS 7000 User manual
- Hendersonfireonline.com Dräger SCBA training links
- HFD Administrative Directive Self-Contained Breathing Apparatus

Firefighter Equipment Guideline – **03**

ELITE XR Thermal Imager

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the thermal imager.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Electro-optical: The ELITE XR is a complex electro-optical device that uses an electric field with light traversing it to produce images. Electronic systems are subject to potential failures. If a failure occurs, the user will no longer have access to the thermal images provided by the ELITE XR.

Intrinsically Safe: The ELITE XR ***is not*** rated as intrinsically safe. Do not use the system in environments or atmospheres where static or a spark will cause explosion.

Digital Direct Temperature (DDT): The DDT provides the average relative (or "observed") temperature of an object, or objects within the crosshairs. The relative temperature is displayed in numerical form in the upper right hand corner of the viewing screen. DDT is operational at all times and cannot be switched on or off.

Sense Mode: Sometimes called a sensitivity mode, or gain mode is similar to the exposure compensation controls in a typical digital camera. The ELITE XR senses heat instead of light. The XR will automatically select what it thinks is the most appropriate sense mode.

*High Sense Mode (**H**)*: This mode is automatically activated by the ELITE XR when objects in its field of view are at room temperature or cooler.

*Mid Sense Mode (**M**)*: This mode is automatically activated by the ELITE XR when objects in its field of view are generally greater than 150°F.

*Thousand Plus Mode (**EI+**)*: This mode is automatically activated by the ELITE XR whenever the crosshair in the center of the viewing screen is directed to objects that are generally greater than 450 – 475°F. While in this mode the ELITE XR is capable of imaging objects that are in excess of 2000°F.

Intelligent Focus Override: Increases the usefulness of a thermal imager by giving the firefighter control over the camera's default sensitivity (sense) mode settings.

Emissivity: An object's emissivity is its ability to either absorb or reflect heat energy. The better the characteristic to absorb heat (the higher the emissive value), and generally the more accurate the temperature reading.

Safety Operations

- The following safety equipment shall be used in conjunction with the ELITE XR fire ground operations at all times:
    1. Structural Firefighting PPE
    2. SCBA
- All users must be thoroughly trained on the ELITE XR proper operation, features and full functionality prior to use. This includes general understanding of thermal images and how they are interpreted. Improper use of the equipment in a hazardous atmosphere could result in death or serious injury.
- The ELITE XR Thermal Imager must only be used by personnel familiar with the uses, proper operation, features and full functionality of the product, including training in simulated fire conditions such as controlled live burn situations. Use of the ELITE XR by unauthorized, unfamiliar or untrained users could result in death or serious injury.
- The ELITE XR is a complex electro-optical device, and just like any other machinery, electronic systems are subject to potential failures. If a failure occurs, the user will no longer have access to the thermal images provided by the ELITE XR. Tactical use of this equipment must not deviate from standard operating procedures used by personnel who do not have the benefit of the equipment.
- Failure to follow standard operating procedures in a hazardous atmosphere could result in death, serious injury or disorientation should equipment failure occur.
- The ELITE XR must be serviced only by ISG / INFRASYS authorized personnel. The ELITE XR includes high voltage components. Removing the cover exposes the user to potential shock hazard which could result in death or serious injury. There are no user-serviceable components.
- The ELITE XR will not provide images through glass, water, or shiny objects. These surfaces act like mirrors to the camera.
- The ELITE XR will not provide thermal images underwater.
- Users should be conscious of the battery life. Only enter a hazardous environment when a full battery charge is indicated on the battery charge indicator.

- The ELITE XR is not rated as “Intrinsically Safe”. Do not use the system in environments or atmospheres where static or a spark will cause explosion.
- Repeated exposure to high temperature environments without adequate periods for the unit to self-cool may result in degradation or loss of the thermal image or damage to the internal components. Be sure to allow adequate cool-down periods between high temperature exposures.
- Exposure to high temperature environments for an extended period of time may result in degradation or loss of the thermal image. Be sure not to overexpose or heat saturate the equipment beyond the design tolerances of the system.
- The service life of the ELITE XR depends in part on how it is used and the environmental conditions in which it is used. Under heavy usage, or under extreme environmental conditions, the service life of the equipment may vary.
- Batteries supplied with the ELITE XR have been designed based on specific performance values. Replacement batteries must be obtained ONLY from an Authorized ISG / INFRASYS Service Center.
- The ELITE XR incorporates automatic electric temperature control systems. Run time on each battery may decrease slightly when used in extreme temperature environments.
- It is important to test the ELITE XR and any other associated accessories often to ensure that the equipment is functional before entering a hazardous environment. Always perform a visual check on the equipment to validate that it has not been damaged or degraded prior to use.
- Never use the ELITE XR as the sole source of navigation. If system failure occurs, you may become disoriented or lost in a hazardous environment which could result in death or serious injury.
- Failure to exit a hazardous environment immediately on observation of the low battery warning may result in system failure in a hazardous environment which could result in death or serious injury.
- The ELITE XR is a navigational tool which provides a thermal image in conditions where vision is impaired. The user should follow safety precautions and protocols, and stay within communications range of the incident command structure. Failure to do so could result in death or serious injury.
- While every effort has been made to ensure that your ELITE XR is both tough and reliable, the camera is a sophisticated electro-optical system that will fail if it is abused or exposed to environments beyond its design envelope.
- ***Failure to observe these warnings could result in death or serious injury***

Task Benchmarks:

Switching the Thermal Imager On and Off

- To switch the unit **On**, press and hold the POWER button (Red) until the ISG/INFRASYS logo appears on the thermal imager display.
- Immediately release the POWER button.
- Once the camera is on, the electronic shutter and iris will automatically evaluate the scene to give continuous and updated thermal information to the viewer.
- This will produce a clicking sound. This is a normal function for the ELITE XR.
- The ELITE XR will select one of the three basic gain modes: *High Sense Mode (**H**), Mid Sense Mode (**M**), Thousand Plus Mode (**EI+**)* indicator will appear on bottom left of display.
- *Intelligent Focus Override Feature* enables firefighters to manually select between Mid Sense and Thousand Plus Modes by placing the crosshairs over warmer/cooler objects to manipulate the gain settings of the camera.
- ***WARNING***: Manipulation of sensitivity mode settings described in this *Intelligent Focus Override Feature* section should only be attempted by users who are:
    - Experienced in fire ground operations
    - Experienced in the usage of thermal imagers in firefighting environments
    - Have received training specifically on the usage of the XR's Intelligent Focus Override feature
    - Users who do not qualify on all three conditions should not attempt to use the *Intelligent Focus Override Feature*
- ***WARNING***: When looking at shiny objects such as chrome, unpainted aluminum, unpainted stainless steel, and other metals, the *DDT* temperature readings can be significantly distorted.
- It should be noted that when viewing a fire scene, *DDT* is measuring the temperature of an object and NOT the air temperature.
- Failure to observe this warning could result in death or serious injury.
- Video capture plus (Yellow) button functioning is disabled on HFD ELITE XR thermal imagers.
- To switch the unit **Off**, press and hold the POWER button until "RELEASE TO TURN OFF" appears on the screen.
- Immediately release the POWER button.

Limitations

- Use retractable lanyard to prevent drops
- Do not use for crawling assist tool
- Protect the camera from falling debris as much as possible
- Protect lens area at all times

Maintenance Procedures

Daily Checks

- Switch the ELITE XR on and ensure temperature display is operational
- Check battery charge state
- Check to ensure sense mode indicator matches the color reference bar
- Turn the ELITE XR off and return to truck charger
- Check ELITE XR for overall cleanliness and any signs of damage

Weekly Checks

- Perform Daily Checks and follow After Use Maintenance procedure

After Use, the ELITE XR should ALWAYS be cleaned and inspected for damage

- Inspect all lenses for soot / dirt buildup. Clean if necessary.
- Normal “intended use” scratches on the high efficiency aspheric lens do not degrade picture quality, however chips may affect lens transmission. Inspect IR lenses for chips.
- Inspect the unit for structural, heat, and/or chemical damage.
- Inspect all battery contacts for damage.
- Inspect battery charger.
- Inspect all batteries and battery adapters for damage or leakage.
- Check all switches including the battery charger for proper indication that systems are running correctly.
- Inspect battery charger contact points for corrosion or damage.
- Make sure battery charger is charging.
- Inspect all lenses for heat or chemical damage, cracks and breaks.
- Inspect the mechanical hardware to make sure no screws have loosened or are missing.
- Store your Thermal Imager in the optional Fast Attack Plus or in the delivery case provided.

- The thermal imager should be cleaned using warm soapy water and nonabrasive cleaners. Allow the thermal imager to completely dry before replacing in its carrying case.
- ***NOTE***: Do not use solvents and abrasive cleaners.
- It is recommended that the display is treated with anti-fog solutions as used on SCBA facemasks.
- To ensure long service life, it is recommended that the thermal imager and its accessories are stored in temperate environment (58°F - 95°F, moderate humidity) at all times
- ***WARNING***: Failure to observe these instructions may result in minor or moderate injury and/or equipment damage.
- ***WARNING***: In the event that any damage is detected (for example, cracked or broken window or housing) the imager should be IMMEDIATELY withdrawn from service and returned to an authorized service center for repair.
- Failure to observe this warning could result in death or serious injury.
- Should the ELITE XR or Fast Attack Plus need repair see ISG/INFRASYS user manual for proper service procedure.

Charging The Battery

- ***NOTE***: This procedure applies to the SuperCell Battery
- ***NOTE:*** For first time use, allow new batteries to remain in the charger for approximately **14 to 16** hours
    - Plug the AC adapter into a 110V AC wall outlet
    - Insert the 2.1mm plug into the charger base. The charger will be in standby mode and the RED LED will flash
    - Align the battery with the battery receptacle as illustrated. Firmly insert the battery into the charger. The GREEN LED will flash indicating the battery is charging
- ***NOTE***: If the RED LED continues to flash **with the battery installed in the charger**, this is an indication that either the battery is not making connection or that the battery is not capable of holding an adequate charge to operate the camera for any length of time
- ISG / INFRASYS batteries and chargers have a 90 day warranty. In the event that the batteries are not charging, contact HFD Equipment Technician.
- When the battery is fully charged, the GREEN LED will stay illuminated indicating that the battery is charged and is in maintenance mode.
- ***NOTE***: You cannot 'overcharge' the Battery.
- Firmly insert the battery into the camera until a 'click' is heard and pull on the battery to ensure proper seating.

Battery Charge State

- The Charge State of the battery is indicated by the ten moving bars located on the lower left hand side of the display.
- As the batteries' charge decreases, the indicator bars on the screen decrease.

Low Battery Warning

- In addition to the Charge State indicator, a separate low battery warning "LOW" appears on the screen.
- The "Battery Low" indicator will appear when three battery bars are remaining.
- ***WARNING***: Failure to observe any low battery warnings and egress to a safe location upon notification, could result in death or serious injury.

Removing the Battery

- Simultaneously and firmly press the battery release catches located on both sides of the camera. This action will release the battery pack and the pack will partially eject from the camera body. Remove the pack by gripping and sliding it out of the camera body.

Fast Attack Plus Truck Charger

- Insert the camera and/or spare battery into the FA charger.
- Be sure the straps are properly adjusted and secured. ALWAYS SECURE THE CAMERA AND BATTERY IN PLACE!
- Proper fastening of the camera and battery will secure them in the event of a roll-over.
- The green LEDs should flash indicating that the batteries are charging.
- When the batteries are charged, the green LEDS should stop flashing and stay on.
- If the red LED turns on there is a problem with the battery. If the red and green LEDs are. flashing, the charger contacts are shorted. Contact HFD Equipment Technician.

ELITE XR Specs

Physical Characteristics

- Weight (nominal): 2.6 lbs.
- Dimensions: 5.4 x 6.5 x 4.5 inches
- Shell Material: Radel R
- Handstrap Material: Kevlar

Infrared Characteristics

- Detector: VOx Uncooled IR Microbolometer
- Spectral Response: 8µm to 14µm
- Total Sensor Resolution (pixels): 76,800
- Temperature Range: Over 2000°F in Thousand Plus Mode
- Focus Range: Fixed, 1.0m to infinity
- IR Protection Window: Germanium
- Sensitivity: 50mK nominal
- Field of View: 50° nominal

Electrical Characteristics

- Sleep Mode: Not Required
- Start Up Time: 5 Seconds (nominal)
- Battery Technology: Rechargeable NiMH
- Recharge Cycles: 500+
- Recharge Time: 2.5 Hours (nominal)

Display Characteristics

- Size (Diagonal): 3.5” (90mm)

Operational Characteristics

- SuperCell Battery ~3 Hours
- Sub-zero Start Up: Yes, Camera will power up below 32oF (0oC)
- Cold Climate Compensation: Not Required
- Water Resistance: IP 67, 3’ 3” (1.0m) depth
- Contaminant Resistant: Yes
- Drop: 6 feet

Firefighter Equipment Guideline – **04**

Ground Ladders

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the ground ladders in accordance with **Chapter 5 Henderson Fire Ground Ladder Manual**.

Level of Training: All Fire/Rescue Operations personnel

Definitions:

Ground Ladder: Term used to designate the difference between ladders raised on the ground and those raised from the apparatus such as a Truck Company.

Safety Operations

- The following safety equipment shall be used in conjunction with ground ladder operations at all times:
    1. Helmet
    2. Gloves
    3. Steel Toe Boots
    4. Full Structure PPE if operating at the scene of a structure fire
- ***WARNING:*** Ground ladders can be used in potentially dangerous situations. All safety operations must be observed at all times.
- ***WARNING*:** Operation of ground ladders without understanding the HFD Ground Ladder Manual, and receiving proper training is a misuse of equipment. Users who have not read and understood all operating and safety instructions are not qualified to operate this equipment.
- Overreaching, overbalancing, or overloading ladder limits are the most common causes of ladder related injuries in general use.
- Gloves shall be worn to reduce the possibility of pinching fingers or skin, which can occur with articulating, folding, or extension ladders.
- A helmet and goggles **or** face shield with approved HFD safety glasses shall be worn to protect the wearer from falling debris.
- Utilize the correct ladder. Altering the climbing angle or working off rungs at the tip can lead to injury.
- All *DUO-SAFETY* Aluminum ladders feature **welded** and **expanded** rungs. This two step process makes certain the rung joints are as strong as the ladder beams, and no looseness can develop
- *DUO-SAFETY* Aluminum Fire ladders feature 6061-T6 aluminum alloy, 1-1/4" corrugated rungs and welded rung joints
- *DUO-SAFETY* extension and roof ladder models are all rated for 750 lb. load with a 4:1 safety factor

- All *DUO-SAFETY* Ladders meet/or exceed all applicable standards as established by the National Fire Protection Association for Fire Service Ground Ladders at time of manufacture

Task Benchmarks:

- Use of the HFD Ground Ladders shall be in accordance with the HFD Ground Ladder Manual.

Equipment Specifications:

Little Giant - 300lb Duty Rated

☐ Size	Open Length	Closed Length	Weight
Model 19	15’	15’	35 lbs
Model 22	19’	11’	42 lbs

10’ Folding ladder (Attic ladder)- 300lb Duty Rated

☐ Size	Open Length	Closed Length	Open Width	Weight
10'	10' 1.87"	11' .25"	12.12"	16 lbs

16’ Roof ladder (Truck Companies)- 750lb Duty Rated

☐ Size	Closed Length	Width	Weight
16'	16' .5"	22.5"	48 lbs

14’ Roof ladder (Engine Companies)- 750lb Duty Rated

☐ Size	Closed Length	Width	Weight
14'	14' .5"	22.5"	44 lbs

24’ Extension ladder- 2 section (Engine Companies)- 750lb Duty Rated

☐ Size	Closed Length	Width	Weight
24'	14' 2.75"	21.75"	72 lbs

28’ Extension ladder- 2 section (Truck Companies)- 750lb Duty Rated

☐ Size	Closed Length	Width	Weight
28'	16' 3.25"	24"	87 lbs

35’ Extension ladder- 2 section (Truck Companies)- 750lb Duty Rated

☐ Size	Closed Length	Width	Weight
35'	20' 3.25"	24"	122 lbs

Maintenance Procedures

Cleaning Ladders

Aluminum

Soap and water works well. Be sure to flush inside the rails and rungs to clear dirt and road salt, etc.

We suggest any liquid car wax and Scotch brand green scrub pad to buff the surface to a smooth finish. Be sure to **clean** and **rewax** the slide areas at the same time.

Be sure to check any heat sensor labels as you clean and wash and try not to wash away the labels. These labels are heat sensitive that turn black at temperatures over 300°F. (Replacement labels are readily available from the ladder manufacturer)

Note:

Refer to the HFD Ground Ladder Manual for specifics on maintenance.

Firefighter Equipment Guideline – **05**

Hand Tool Maintenance

Goal: To provide an Equipment Guideline Standard to ensure consistent maintenance of the Henderson Fire Department hand tools.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Bright Work: Polished metal parts.

Fiberglass: Fiberglass is a material consisting of extremely fine glass fibers and is major component of a wide variety of hand tools.

Maintenance

Daily Checks

- Visually inspect hand tool inventory for any signs of damage or debris.
- Any signs of damage shall be reported through the chain of command, and the tool shall be Red Tagged and removed from service if not functional.

Weekly Checks

- Perform Daily Checks
- Heavily soiled tools shall be cleaned using soap and water.
- On fiberglass tools, if debris is not removed it may be necessary to use a light abrasive to remove debris.
- Any signs of tarnish, or rust on bright work shall be corrected using approved department metal polish.
- Grip tape if present on tools shall be inspected and replaced if torn/frayed.

Additional Maintenance

- Tools requiring paint shall be maintained based on individual company standards.
- All hand tools shall be labeled with department issued unit identification decal.
- Unit decal shall be changed when damaged.

After Use

- Hand tools shall be cleaned and inspected after each use.

Firefighter Equipment Guideline – **06**

Portable Gas Blower

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the gas blower.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Portable Gas Blower: Also known as the *fan* provides positive pressure ventilation (PPV). The terms fan, blower, and PPV can be used interchangeably.

Fuel Valve Lever: The fuel valve opens and closes the connection between the fuel tank and the carburetor.

Engine Switch: The engine switch enables and disables the ignition system.

Choke Lever: The choke lever opens and closes the choke valve in the carburetor.

Throttle Lever: The throttle lever controls engine speed.

Recoil Starter Grip: Pulling the starter grip operates the recoil starter to crank the engine.

Safety Operations

- The following safety equipment shall be used in conjunction with portable gas blower operations at all times:
    1. Gloves
    2. Full Structure PPE if operating at the scene of a structure fire
- The emergency use of the *Unifire* fan will be consistent with operations outlined in the HFD **TS-01 Offensive Fire Attack with Positive Pressure Ventilation**.
- *Honda* engines are designed to give safe and dependable service if operated according to instructions.
- Know how to stop the engine quickly, and understand the operation of all controls. Never permit anyone to operate the engine without proper instructions.
- ***DANGER***: Refuel with care. Gasoline is extremely flammable, and gasoline vapor can explode. Refuel outdoors, in a well-ventilated area with the engine stopped.

- To prevent fire hazards and to provide adequate ventilation, keep the engine at least 3 feet away from building walls and other equipment during operation.
- Exhaust gas contains poisonous carbon monoxide. Avoid inhalation of exhaust gas.
- ***WARNING***: Improperly maintaining this engine, or failing to correct a problem before operation, could cause a malfunction in which you could be seriously injured.
- ***WARNING***: Always perform a pre-operation inspection before each operation, and correct any problem.

Controls & Features

- The fuel valve lever must be in the *ON* position for the engine to run.
- When the engine is not in use, leave the fuel valve lever in the *OFF* position to prevent carburetor flooding and to reduce the possibility of fuel leakage
- The engine switch enables and disables the ignition system. The engine switch is the red switch on the right side of the motor.
- The choke lever activates the choke valve in the carburetor.
    - The *CLOSED* position enriches the fuel mixture for starting a cold engine.
    - The *OPEN* position provides the correct fuel mixture for operation after starting, and for restarting a warm engine.
- The choke lever is the upper lever. The *OPEN* position is when the lever is all the way to the right.
- Moving the throttle lever from right to left will make the engine run faster.
- The throttle lever is the top metal lever.
- Pulling the starter grip operates the recoil starter to crank the engine.

Task Benchmarks:

Starting Procedure

- Perform proper Daily Check prior to starting the fan
- Perform the recommended starting method as follows:
    1. The fuel valve lever must be in the *ON* position for the engine to run
        a. *ON* position is all the way to the right
    2. The engine switch must be in the *ON* position for the engine to run.
    3. To start a cold engine, move the choke lever to the *CLOSED*
        a. To restart a warm engine, leave the choke lever in the *OPEN* position
    4. Move the throttle lever away from the *SLOW* position (towards the Left), about 1/3 of the way toward the *FAST* position

5. Pull the starter grip lightly until you feel resistance, then pull briskly. Return the starter grip gently.
6. If the choke lever has been moved to the *CLOSED* position to start the engine, gradually move it to the *OPEN* position as the engine warms up.
7. Position the throttle lever for the desired fan speed
8. Place and operate fan per HFD **TS-01 Fast Attack**

Stopping Procedure

1. To stop the engine in an emergency, turn the engine switch to the *OFF* position
2. Under normal conditions, move the throttle lever to the *SLOW* position and then turn the engine switch to the *OFF* position.
3. Turn the fuel valve lever to the *OFF* position

Maintenance Procedures

Daily Checks

- Perform a visual inspection: look around and underneath for signs of leaks and/or damage
- Check the fuel level. Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.

Weekly Checks

- Perform Daily Checks
- Check the engine oil level. Running the engine with a low oil level can cause engine damage.
- Check proper operation of the fan. Run to operating temperature (approximately 5 min.)
- Check fan at idle (approximately 1 min.)
- Shut fan down and restart (Hot start check)
- After operation, clean and refuel as necessary

After Use

- If the fan is still serviceable, steps must be taken to ensure readiness of the fan prior to placing it back in the apparatus compartment
- To ensure readiness perform a Daily Check
- Allow the engine to cool for at least 15 minutes before loading the fan back in the apparatus.

Extended Maintenance

- The HFD Equipment Technician will schedule and maintain the fan per manufacturer's specifications to include, but will not be limited to:
    - Change fuel in the fan quarterly.
    - Check air filter and change annually
    - Check fuel sediment bowl and/or fuel filter
    - Change fuel filter annually
    - Check spark plug and change annually
    - Check carburetor adjustments
    - Change engine oil annually

Extended Operation

- It may be necessary to use the fan for extended periods. During lengthy operations it may become necessary to refuel the fan.
- ***DANGER***: Fuel hot fans with extreme caution. Fuel spilled onto a hot engine will cause the fuel to vaporize quickly, creating an extreme hazard.

Cleaning

- The fan shall be thoroughly cleaned after each use.
- If the engine has been running, allow it to cool for at least half an hour before cleaning.
- Clean all exterior surfaces
- ***CAUTION***: Using a hose or pressure washing equipment can force water into the air cleaner or muffler opening. Water in the air cleaner will soak the air filter, and water that passes through the air filter or muffler can enter the cylinder, causing damage
- ***CAUTION***: Water contacting a hot engine can cause damage. If the engine has been running, allow it to cool for at least half an hour before washing.

Equipment Specs

- *Honda* Motor Model GX120
  - 5.5 HP
  - Fuel Tank Capacity: 0.66 gal
  - TRUFUEL 4 cycle
  - Engine Oil Capacity: 0.63 US qt.
  - Use 4 stroke, SAE 10W – 30 oil
- *Unifire* Gas Blower: Models DST-3P4 (wheels) and DS-3P4 (no wheels)
  - Utilizes an 18”, 4 blade fan
  - Weight including engine, fan, framing: 81 lbs.
  - Fan angle adjustment from -10° to +20°
  - 35” extendable handle

Firefighter Equipment Guideline – **07**

Extinguishers

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the Class A and Dry Chemical extinguishers.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Class A: Fires involving ordinary combustibles wood, paper, cloth, plastics, and rubber.

Class B: Fires involving flammable and combustible liquids, gases, and greases.

Class C: Fires involving energized electrical equipment.

PASS: Is the pneumonic used to fire extinguisher operations. PASS stands for Pull, Aim, Squeeze, Sweep.

Safety Operations

- Extinguishers contain contents under pressure. Do not puncture or incinerate.
- Do not use if damaged or corroded.
- Follow proper discharge distance to avoid the splashing or scattering of burning material.
- Do not expose to temperatures above 120 °F.
- Do not discharge directly into face.
- Use only as a fire extinguisher. Do not attempt to use for any other purpose.
- Refer to *Ansul* MSDS for additional agent information.

Task Benchmarks

1. Hold upright pull ring pin.
2. Start back 10 feet, aim at base of fire.
3. Squeeze lever.
4. Sweep side to side.

Maintenance Procedures

After Use Maintenance for Dry Chemical Extinguisher

- Partial discharge may cause extinguisher to leak.
- Invert and press the operating lever to release all remaining pressure.
- The HFD does not service or recharge Dry Chemical extinguishers. Contact HFD Logistics Division for replacement extinguisher.
- HFD Logistics Division will coordinate recharging by an *Ansul* authorized distributor.
- All Dry Chemical extinguishers are to be installed, inspected, maintained and tested accordance with standards for portable fire extinguishers, NFPA 10.

After Use Maintenance for Pressurized Water Extinguisher

- Partial discharge may cause extinguisher to leak.
- Invert and press operating lever to release all remaining pressure.
- Empty and rinse extinguisher with warm water getting all remaining foam out of tank.
- Recharge with 2.5 gallons of water.
- Then add 1 cup Class A foam (Phos-Chek WD 881).
- After placing nozzle carrying handle on top and only hand tightening, pressurize with 100 psi of air.
- All Dry Chemical extinguishers are to be installed, inspected, maintained and tested accordance with standards for portable fire extinguishers, NFPA 10.

Daily Checks

- Check pressure is in operating range.
- Check unit for damage or corrosion.
- Check to make sure nozzle and hose is unobstructed.

Weekly Checks

- Perform Daily Checks.
- Check Service Date of Dry Chemical Extinguisher.

Cleaning

- The extinguisher shall be thoroughly cleaned after each use.

Equipment Specs

Dry Chemical

- Model Sentry AA20
- 20lb Dry Chemical Extinguisher
- 10-A
- 120 B:C
- 28 second discharge time
- Maximum effective range 22 ft.
- Operating temperature range -40 to 120 ° F
- Charged weight 32 lbs.

Pressurized Water

- MODEL AMEREX 240
- 2 ½ Gallon
- 2A
- 50 second discharge time
- Maximum effective range 25 ft.
- Operating temperature range -40 to 120 ° F

Firefighter Equipment Guideline – **08**

STIHL MS 460 Chain Saw

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the chain saw.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Chain Sprocket: The toothed wheel that drives the saw chain.

Chain Brake: A device to stop the rotation of the chain if activated in a kickback situation by the operator's hand or by inertia.

Chain Tensioner: Permits precise adjustment of chain tension.

Guide Bar: Supports and guides the saw chain.

Front Hand Guard: Provides protection against projecting debris and helps prevent hand from touching the chain if it slips off the handlebar. The front hand guard manually activates the chain brake.

Decompression Valve: Automatically resetting, makes starting easier by allowing a portion of the built up piston compression to escape, this in turn allows for the saw to start easier.

Master Control Lever: Lever for choke control, starting throttle, run and stop switch positions.

Throttle Trigger: Controls the speed of the engine.

Kickback: May occur when the moving saw chain near the upper quadrant of the bar nose contacts a solid object or is pinched resulting in a rotational force on the chainsaw in the direction opposite to the chain movement.

Fuel Mix: The engine is certified to operate on unleaded gasoline (min. octane rating 89) and the STIHL two-stroke engine oil at a mix ratio of 50:1. The current fuel standard is the *TRUFUEL 50:1.*

Safety Operations

- The following safety equipment shall be used in conjunction with chain saw operations at
- all times:
    1. Gloves
    2. Goggles
    3. Helmet
    4. Full Structure PPE and SCBA if operating in fire suppression operations
- Although equipped with a centrifugal clutch, the chain of a chain saw at idle speed may continue to spin. Therefore, turning with a running chain saw in hand must be done with extreme caution.
- When cutting, the operator should strive to be positioned to keep the chain out of line with the body. The proper positioning of the chain saw and body could prevent injury from a broken chain, flying debris, or chain saw kickback.
- Chains are capable of dislodging and throwing objects such as nails, small rocks and splinters for a considerable distance. Eye protection shall be worn by all members involved in chain saw operations.
- Cutting is an operation involving a minimum of two members: the operator and safety person. The primary responsibility of the safety person is to:
    1. Alert the operator of changing or unsafe conditions
    2. Prevent injury
    3. Assist the operator who is backing up while involved in cutting operations.
- Since a running chain saw creates a serious communication problem, the safety member will have to use gestures or "body language" to communicate effectively. The safety member must maintain contact with the operator at all times. An effective way for the safety member to remain in contact with the operator is to use an UNDERHANDED grip on an axe scabbard belt, SCBA frame/webbing, etc.

Task Benchmarks:

Starting Procedure

- Perform proper daily check prior to starting saw.
- Perform the recommended starting method as follows:
- Place saw on the ground with chain brake engaged.
- Depress decompression valve.
- For a cold start press the throttle trigger lockout and throttle trigger, then move the Master Control lever all the way down from **0** to **|\|.**
- Grip the front handlebar of the saw firmly with left hand and press down.
- Put the toe of your right foot into the rear handle and press down.

- With your right hand pull out the starter grip slowly until you feel a definite resistance and then give it a brisk, strong pull.
- ***WARNING!*** Be sure the guide bar and chain is clear of you and all other obstructions and objects, including the ground.
- If the engine fires only briefly and dies, move the Master Control Lever up one notch to the half throttle to open the choke **)\(** "Warm Start" and pull the starter rope again until the engine fires.
- As soon as the engine is running immediately blip the throttle trigger, disengaging the throttle lock and move the saw to normal idle.
- Release the chain brake by pulling the hand guard toward you with your left hand. When you hear a click sound, this means the chain has been released.
- Check the chain lubrication, hold the saw against a light background and open the throttle fully. If some bar oil appears on the ground it is safe to start work.
- If no oil appears on the ground, check bar oil, and oiler screw.
- ***CAUTION!***: Do not operate the chain saw at continuous full RPM without a "load" on the
  Chain.
- The saw is now ready for use. Refer to HFD **TS-17/TCPS-17 Vertical Ventilation** for proper cutting techniques.

Maintenance Procedures

Extended Operation

- It may be necessary to use the chain saw for extended periods. During lengthy operations it may become necessary to refuel the chain saw, add chain lubricating oil, and adjust chain tension.
- *Fueling*: Fuel hot chain saws with extreme caution. Fuel spilled onto a hot exhaust pipe will cause the fuel to vaporize quickly, creating an extreme hazard. Clean all debris away from the fuel cap before opening.
- *Chain Lubrication*: Lack of lubrication will cause chain failure and unnecessary wear to the guide bar. Saws with automatic oilers should be adjusted for maximum oiling. This will cause the saw to use lubricating oil faster than fuel, requiring more frequent oil level checks during extended operations. Clean all debris away from the oil cap before opening.
- *Oil Quality Control:* Use the adjusting screw on the underside of the saw to vary the oil feed rate. To increase oil feed turn adjusting screw clockwise.
- *Chain Tension*: Extended operations will cause chain tension to loosen. See "Chain Tension Adjustment".

After Use

- If the chain saw is still serviceable, steps must be taken to insure readiness of the chain saw prior to placing it back in the apparatus compartment.
- Wipe off debris. Pay particular attention to the air cleaner cover, fuel cap, and oil cap
- Check condition of chain. Replace chain if necessary.
- Remove heavy tar deposits from the chain bar and body of the chain saw using solvent if carried on the apparatus.
- Remove the air filter. Gently strike the filter on the palm of your hand to dislodge foreign objects. Inspect for tears and general condition. If torn or excessively dirty replace as soon as a spare filter is available. Reinstall filter.
- When the chain saw has cooled, add the specified fuel to capacity.
- Add chain lubricating oil to capacity.
- Adjust chain tension as indicated.
- Start chain saw and run to insure proper operation.
- Make a general inspection, of the chain saw.
- Place all switches in ready position and replace in apparatus compartment.
- Upon return to quarters, clean chain saw as described in cleaning guide.

Chain

- Carbide-tipped chains used on this Department are resistive to dulling but subject to chipping.
- Cutting into materials other than wood or composition roof coverings should be avoided (steel hangers, conduit, plumbing, etc.). Cuts into rock covered composition roofs should be started after clearing sufficient rock (s) or starting the hole using a pick headed axe. This will ensure that the hole will be started in a cleared area. This will extend chain life. It is not necessary to clear rock in other than the area where the cut begins.
- If carbide tips become damaged, it will be necessary to replace the chain when:
    - Missing/damaged tips on 3 or more cutters in a row
    - Missing /damaged tips on 6 or more cutters at random
    - Cracked/broken tie straps
    - Dull chain

Chain Tension Adjustment

- Proper chain tension is extremely important to the life of the guide bar and chain.
- Tension must be checked before, during, and after use. During extended cutting operations, check chain tension every few minutes.

- Various conditions encountered during ventilation will affect chain tension. Roofs with heavy composition will heat chains more rapidly than new roofs with light composition.
- These factors will help determine how often adjustment checks should be made. If the chain becomes excessively loose and jumps the drive sprocket serious damage to the saw and chain could result.
- Proper chain tension adjustments are made in the following manner:
    - Loosen drive sprocket cover nuts
    - Grasp tip of guide bar and raise to remove slack between guide bar and mounting studs
    - Adjust tension screw, located inboard of the guide bar on the front of the chain saw. Turn clockwise to tighten
    - ***NOTE*:** Avoid injury by using gloves or wiping rag to protect hand when making adjustments or pulling chain through its travel
    - While tightening adjusting screw, pull chain through its travel to locate any high spots. Make final tension adjustment to tightest place on chain
    - Tension is correct when the chain travels freely around the bar as it is pulled by hand and the bottoms of all tie straps and cutters touch the underside of the bar rails
    - Tighten drive sprocket cover nuts

- Since heat is the primary factor causing the chain to loosen, the chain will contract when allowed to cool. Hot chains that have been adjusted during extended operations must be loosened to allow contraction as the chain saw cools. Failure to do this could cause excessive tension on the chain and drive sprocket resulting in serious damage to the chain saw and/or chain.

Daily Checks

- Check fuel level. Add mixed fuel if necessary.
- Check lubricating oil level. Add if necessary.
- Check chain condition, tension, and proper direction of travel.
- Check controls for proper starting position.
- Make a visual check of the entire chain saw for loose fasteners and/or covers.

Weekly Checks

- Perform Daily Checks.
- Start chain saw.

- Run up RPM by alternately depressing and releasing throttle trigger. Run until warm.
- ***CAUTION:*** Do not run chain saw at full RPM without load for more than a few seconds or engine damage may result.
- Check to see if chain is oiling properly.
- Place chain saw on firm surface. At idle speed, engage chain brake. Improper chain brake operation shall be reported to the HFD Equipment Technician.
- Shut off chain saw and allow it to cool.
- Check chain tension and readjust if necessary.
- Inspect starter cord for fraying and contamination. Inspect integrity of starter cord handle
- Top off fuel and chain lubricating oil levels if necessary.

Additional Maintenance

- Additional Maintenance shall be performed in accordance with manufacturer requirements.
- Additional Maintenance will be scheduled and completed by HFD Equipment Technician.
- Perform Daily Checks.
- Remove spark plug. Check gap and condition. Clean, regap or replace if necessary.
- ***NOTE:*** Proper spark plug gap can be determined by reviewing owner's manual specifications or contacting the shops. Always have a spare spark plug available for use.
- Inspect engine case for cracks and/or leaks.
- Inspect the fuel assembly for leaks, cracks or soft fuel lines. DO NOT operate chain saw if a fuel leak exists.
- If a tank of fuel has not been used in the previous 30 days, drain fuel and refill with fresh fuel mix.
- Remove air cleaner housing. Check air cleaner for tears and general condition.
- Inspect security of carburetor and all linkage.

Cleaning

- The chain saw shall be thoroughly cleaned after each use.
- ***NOTE:*** Petroleum based solvents, including kerosene, used to clean tar from chain saw parts shall not be applied in atomized form.
- ***CAUTION:*** Failure to clean all molten tar and debris from cylinder and head fins WILL result in overheating. It is extremely important that ALL covers and cowlings be removed to expose hidden cooling fins. Refer to STIHL Chain Saw Users Manual for detailed cleaning guidelines.

These instructions do not preclude any additional maintenance checks as required by the owner's Manual or by the member performing maintenance.

STIHL MS 460 Specs

- Single cylinder two-stroke engine
- Displacement: 4.67 cu. In
- Idle Speed: 2500 rpm
- Spark Plug: Bosch WSR 6 F
- Electrode Gap: 0.02 in (0.5 mm)
- Fuel Tank Capacity: 1.69 US
- TRUFUEL 50:1
- Oil Tank Capacity: 0.68 US pt (0.325 l)
- Weight: 15.2 lbs
- Rollomatic Bar: 16, 18, 20, 25 in

Firefighter Equipment Guideline – **09**

Partner K1250 Rotary Saw

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the rotary saw.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Front Handle: Handle bar for left hand.

Cutter Wheel: Available in three major types: abrasive wheels, diamond blades, and carbide tipped blades.

Drive Flange: Transmits torque from drive shaft to cutter wheel.

Starter Grip: The grip of the pull starter used to start the engine.

Stop Control: When lever is pulled back, the engine stops.

Choke Control: When lever is pulled back, the engine is choked (starting position, cold engine).

Safety Throttle Lock: Prevents accidental acceleration. Must be depressed before the throttle trigger can be used.

Rear Handle: Support Handle for right hand, incorporates throttle trigger and safety throttle lock.

Throttle Trigger: Controls the engine speed.

Throttle Lockout: The throttle trigger lock is designed to prevent accidental operation of the throttle. When the lock is pressed in this releases the throttle.

Gyroscopic Effect: Caused by the spinning blade. This makes the saw somewhat unwieldy when changing its cutting angle.

Kickback: Can happen extremely fast and with great force. Failure to comply with safety rules can result in a severe or even fatal injury. If the upper portion of the cutting blade is used the blade may start climbing in the cut and throw the saw up and back towards the operator with great force.

Fuel Mix: The engine is certified to operate on unleaded gasoline (min. octane rating 90) and the HUSQVARNA two-stroke oil or equivalent at a mix ratio of 50:1. The current fuel standard is the *TRUFUEL 50:1.*

Safety Operations

- The following safety equipment shall be used in conjunction with chain saw operations at
  all times:
  1. Gloves
  2. Goggles
  3. Helmet
  4. Turnout Coat
  5. Full Structure PPE and SCBA if operating in fire suppression operations

- Hazards unique to the rotary saw make it an extremely dangerous tool.
- The blade continues to spin at high RPMs long after the throttle is released, or after the saw is shut off.
- Leaving the saw unattended in this condition should not be done under any circumstances.
- The blade should be stopped in the work or monitored until it stops spinning.
- Turning with a running saw in hand must be done with extreme caution.
- The gyroscopic effect caused by the spinning blade makes the saw somewhat unwieldy when changing its cutting angle (this is inherent to the saw and the operator should be aware of this).
- Particular care should be paid to the surrounding area. When cutting metal, the saw throws off hot sparks that can provide an ignition source in flammable atmospheres, or to combustible solids.
- Care should be taken to have firefighters and extinguishing equipment in place prior to the cutting operation if the situation calls for these precautions.
- Care must be taken that the area in the path of the sparks is clear prior to cutting with the saw. Hot sparks can be thrown up to 15 feet from the cutting area.

Use of Blades

- Rotary saws in use by this department use the standard issue 12 in diamond tipped blade.
- The diamond blade is a fast cutting blade with a blend of hardened, synthetic diamond material fastened to the outer edge. This blade can cut metals, masonry, reinforced concrete, and mixed materials.
- The department also issues 12 in abrasive disk blades for masonry/concrete, metal, and general purpose cutting.
- Truck Companies also utilize a 14 in diamond tipped blade.

Task Benchmarks:

Starting Procedure

- Perform proper daily check prior to starting saw
- ***Perform the recommended starting method as follows:***
- For a ***cold start***, place saw on the ground, slide the ignition switch to the left
- Pull the choke control fully out
- Press in the throttle trigger lock, throttle control and then the start throttle lock
- Release the throttle control and it is locked in the half throttle position
- The lock releases when the throttle control is pressed in fully
- Depress the decompression valve to facilitate the start of the power saw
- For a ***warm start***, use the same starting procedure as for a cold engine but without setting the choke control in the choke position
- Grip the front handle with your left hand. Put your right foot on the lower section of the rear handle pressing the saw against the ground
- Grip the starter handle, slowly pull out the cord with your right hand until you feel some resistance (the starter pawls grip), now quickly and powerfully pull the cord
- ***CAUTION!*** Do not pull the starter cord all the way out and do not let go of the starter handle when the cord is fully extended. This can damage the machine
- When the engine starts, quickly apply full throttle to automatically disengage fast idle
- The engine is stopped by switching the ignition off using the stop switch
- The saw is now ready for use. Refer to HFD **TS-15 & TS-16 Forcible Entry** for proper cutting techniques
- ***WARNING!*** Never use the power cutter without a blade guard over the cutting blade
- To prevent the blade from binding during cutting operations, use the following procedures:
    - Adjust blade guard to control cutting depth
    - Enter all cuts at full rpm
    - While cutting vertical surfaces, make certain blade is kept at right angle to surface
    - Always cut in straight line (do not twist saw to, either side)
    - Release throttle and immediately remove blade from cutting surface if binding occurs to avoid belt damage

Maintenance

Daily Checks

- Check fuel level
- Check the blade for sharpness and proper mounting
- Check the blade guard for damage
- Make a visual check of the saw for loose nuts and bolts
- Check that the components of the throttle control work smoothly (throttle control and throttle trigger lock)
- Check the starter and starter cord and clean the outside of the starter unit's air intake
- Check that the stop switch works correctly

Weekly Checks

- Perform Daily Checks
- Start the saw and run until warm
- Run up the RPM to verify that the blade runs true and smooth without wobble or vibration

Additional Maintenance

- Additional Maintenance shall be performed in accordance with manufacturer requirements.
- Additional Maintenance will be scheduled and completed by HFD Equipment Technician.
- Inspect the engine case for cracks or leaks.
- Inspect the fuel assembly for leaks, cracks or soft fuel lines. **DO NOT** operate saw if there is a fuel leak.
- Check the belt for condition and tension. If belt is worn or frayed, replace.
- If a tank of fuel has not been used in the previous 30 days, drain fuel and refill with fresh 50:1 mix.
- Perform additional maintenance as recommended by the K1250 Operators manual.

After Use

- Refuel saw as necessary.
- Examine cutting blades after each use. Blade should meet the criteria in the following section titled "Mounting or Changing Blades".
- Check blade tip for damage and sharpness.
- Check the air filter for accumulation of debris and fiber condition. To remove trapped debris, tap the filter gently on the palm of your hand.
- Compressed air or solvents should not be used to clean paper filters.
- Check for loose or bare wires, loose nuts and screws, and cracked or broken parts. Tighten or repair as necessary.
- The rotary saw shall be thoroughly cleaned after each use. Particular attention should be paid to cylinder and head fins if soiled with molten tar. Use only approved cleaning agents. Water shall not be used.
- Rotary saws should have all abrasive dust removed by blowing with compressed air (wear goggles, and respiratory protection).

Mounting or Changing Blades

- Before mounting any blade on a rotary saw, blades shall be inspected for signs of deterioration, wear, and cracks, which could render the blade unsafe.
- After use, blades shall be similarly inspected, if they are to remain on the saw.
- Hold the blade in place. Remove the blade retaining bolt on the opposite side of the cutter arm by turning it counterclockwise with the combination wrench.
- Remove the large flange washer.
- Mount desired blade in proper position, and secure against opposite flange washer.
- Replace outer flange washer against blade and secure retaining bolt, wrench-tight.
- Additional abrasive blades shall be stored in a separate compartment than fuel.

Flooded Cylinder

- Place on/off switch in "off" position
- Turn saw on its side (exhaust side down)
- Push in choke ("off" position)
- Pull starter rope, 4-5 times, to clear cylinder of fuel
- Place switch in "on" position and use normal starting procedures

Partner K1250 Specs

- Idle speed: 2500 RPM
- Fast Idle Speed: 9750 RPM
- Spark Plug: Champion RCJ 6Y / NGK BPMR 7A
- Spark Plug Gap: 0.5mm
- Fuel Tank Capacity: 1.25 L
- TRUFUEL 50:1 2 Stroke
- Weight Without Fuel and Blade: 30lbs
- MAX RPM output shaft: 5100 RPM

Firefighter Equipment Guideline – **10**

Reciprocating Saw

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the reciprocating saw. The DeWalt DW309 is a variable speed reciprocating saw. The saw is designed for cutting wood, metal, and various other materials, such as plastics, fiberglass, hard rubber, etc. When paired with the right blade the saw can handle the toughest fire and rescue work.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Reciprocating Saw: A reciprocating saw is an electric saw that uses a push pull method of reciprocating the motion of the blade. It is commonly referred to as the sawzall.

Trigger Switch: The variable speed trigger switch will give you added versatility. The further the trigger is depressed the higher the speed of the saw. To turn the saw off release the trigger

Speed Range Selector: The speed range selector wheel controls the speed of the tool. To select a slow speed for operating the saw, rotate the wheel to a low number on the dial. To select a higher speed, rotate the wheel to a higher number

Adjustable shoe: The shoe will adjust to limit the depth of cut. Hold the saw with the underside facing up. Push the button on the hand grip and slide the shoe out to one to the three settings and release the button

Blade Clamp: The blade clamp release lever permits the operator to change the blade quickly without the use of a tool or hex wrench

Safety Operations

- The following safety equipment shall be used in conjunction with sawzall operations at all times:
    1. Gloves
    2. Goggles
    3. Helmet
    4. Turnout Jacket, Turnout Pants, and Helmet when used in accordance with HFD **TS-14 Hydraulic Extrication**
- Stay alert, watch what you are doing and use common sense when operating the saw.

- Avoid accidental starting. Be sure switch is off before plugging in. Carrying tools with your finger on the trigger switch or plugging in tools that have the switch on invites accidents.
- Do not overreach. Keep proper footing and balance at all times. Proper footing and balance enables better control of the tool in unexpected situations.
- Disconnect the plug from the power source before making any adjustments, or storing the tool.
- Blade selection (blade length) and tool operation is critical in situations where the blade cannot be fully visualized by the operator and there is a possibility that the blade could contact a trapped victim.
- Ensure blade clamp is secure before use.
- Appropriate safeguards should be taken to minimize the risk of ignition of flammable vapors that may be present at the scene of vehicle extrication
- ***DANGER***: When using the saw wherever live wires may be encountered, do not touch any front metal parts of the saw.
- ***DANGER***: To avoid electric shock prevent body contact with grounded surfaces such as pipes, radiators, stoves, etc. Make cuts in walls shallow to avoid contacting electrical wiring.

Task Benchmarks:

Starting Procedure

- Perform proper daily check prior to starting saw.
- Perform the recommended starting method as follows:
    1. Connect power cord to extension on board extension cord reel or *Honda* generator.
    2. Hold the saw by insulated gripping surfaces: one hand should hold the trigger switch on the handle, while the other hand firmly grasps the rubber front housing cover.
    3. Place the blade against the work to be cut.
    4. Hold the saw firmly. Squeeze the trigger switch to start the motor.
    5. Allow saw motor to obtain maximum speed before applying pressure.
    6. Whenever possible, the adjustable shoe must be held firmly against the material being cut.
    7. Release the trigger switch to stop the motor.

Application

Plunge Cut/Pocket Cut

- The Sawzall can be used for plunge cutting wood, plywood, wallboard, and plastic materials. ***Do Not*** attempt to plunge cut metal.
- To start the cut, rest the saw on the shoe bracket with the blade not touching the surface to be cut. Start the saw. Using the shoe bracket as a pivot, rotate the blade into the work while drawing the saw backward slowly. When the blade has cut through the work, continue raising the saw until it is perpendicular to the work surface.

Metal Cutting

- The sawzall has different metal cutting capabilities depending on type of blade used and the metal to be cut.
- Do not force the cutting blade as this reduces blade life and may cause breakage.

Vehicle Extrication

- Use in vehicle extrication shall follow procedures outlined in HFD **TS-14 Hydraulic Extrication**.
- The reciprocating saw is a valuable adjunct to the AMKUS and Holmatro extrication tools during physical rescue incidents involving vehicle extrication. Utilizing the sawzall, the A, B, and C posts of a car can be cut as fast, or faster, than the hydraulic cutters.
- When using the saw to remove the roof of a car the front windshield is left in place. The first cut through the A post is continued across the window to the A post on the opposite side of the car.
- The saw is noticeably faster than the hydraulic cutters on wide support posts.
- The saw has also proven effective in tight spots as might be found with a driver's feet entangled with the brake or clutch pedal.

Maintenance Procedures

Blade Installation

- ***WARNING***: Before installing or changing out blades disconnect saw from power.
- Lift blade clamp release lever to unlock blade clamp locking mechanism.
- Insert appropriate blade into the clamp until it bottoms. Normally blades are inserted with the teeth facing down. The blade clamp will accept the blade in either position, teeth up or down.
- Press down blade clamp lever to lock blade in place.
- Grasp blade lightly and pull traction against saw to ensure blade clamp is locked.
- To remove the blade, repeat procedure to release blade clamp lock.

After Use

- If the sawzall is still serviceable, steps must be taken to ensure its readiness prior to placing it back in the apparatus compartment.
- To ensure readiness perform a Daily Check.

Daily Checks

- Perform a visual inspection:
    - Check for any signs of damage to the saw or blade.
    - Check power cord for any signs of damage to insulation.
    - Ensure back up/replacement blades are available.

Weekly Checks

- Perform Daily Checks.
- Check proper operation of the sawzall.
- After operation, clean and replace blade as necessary.

Cleaning

- The sawzall shall be thoroughly cleaned after each use.
- Following use, blow out all air passages with dry compressed air.
- All plastic parts should be cleaned with a soft damp cloth.

These instructions do not preclude any additional maintenance checks as required by the owner's Manual or by the member performing maintenance.

Equipment Specs

- *DeWalt* DW309 Reciprocating Saw
- 11.8 Amp 120 V
- 2700 strokes per minute with a 1 $^{1}/_{8}$" stroke length
- Approx. 18" long and 9 lbs.
- *Milwaukee* TORCH Bi Metal cutting blade
- The TORCH blade is designed for the toughest Fire and Rescue work, demolition, plumbing, remodeling or general metal cutting applications.
- The TORCH blades will cut pipe, conduit, angle iron, steel and other hard materials. TORCH blades are 1 inch tall for straight, fast cutting, and 0.042 inch thick for longer life with the ability to flex in tight cutting situations.
- *Milwaukee* Sawzall blades have a unique heat treating process that extends the life of the blades.
- TORCH blades are designed to resist breaking, further extending blade life.
- The 18 teeth per inch blade should be used on material $^{1}/_{8}$ inch through $^{3}/_{16}$ inch thick.

Firefighter Equipment Guideline – **11**

AMKUS Hydraulic Rescue Tools

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the AMKUS hydraulic rescue tools. The AMKUS rescue tools are hydraulically powered devices used primarily for vehicle extrications and heavy rescue applications. They are capable of developing thousands of pounds of pressure to spread, cut, pull, or lift to effect a rescue operation.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Sight Gauge: The sight gauge is the window visible on the front of the hydraulic fluid reservoir. The hydraulic fluid need only be visible at the ½ mark in the window. It is not necessary for hydraulic fluid to completely fill the sight gauge window.

Quick Couplings: The quick couplings are the couplings found on the hydraulic hoses. These couplings are designed to safely and quickly hot swap tools.

Dead Man: The dead man feature ensures that the tool will only operated with constant applied pressure to the control valve. Releasing the control valve on the tool will stop all movement of the tool.

Safety Operations

- The following safety equipment shall be used in conjunction with hydraulic tool operations at all times:
    1. Gloves
    2. Eye Protection
    3. Turnout Jacket, Turnout Pants, and Helmet when used in accordance with HFD **TS-14 Hydraulic Extrication**
- *Honda* engines are designed to give safe and dependable service if operated according to instructions.
- Know how to stop the engine quickly, and understand the operation of all controls. Never permit anyone to operate the engine and tools without proper instructions.
- ***DANGER***: Refuel with care. Gasoline is extremely flammable, and gasoline vapor can explode. Refuel outdoors, in a well-ventilated area with the engine stopped.
- To prevent fire hazards and to provide adequate ventilation, keep the engine at least 3 feet away from building walls and other equipment during operation.
- Exhaust gas contains poisonous carbon monoxide. Avoid inhalation of exhaust gas.

- ***WARNING***: Improperly maintaining this engine, or failing to correct a problem before operation, could cause a malfunction in which you could be seriously injured.
- ***WARNING***: Always perform a pre-operation inspection before each operation, and correct any problem
- Work safely: As one member operates the tool, a second member shall provide "back up" for the operator.
- ***WARNING***: Keep body parts away from the working end of the tool.
    - Avoid situations that place you in between the tool and the work. If you end up in this position, stop the tool and place yourself on the opposite side of the tool.
    - Be aware of a rotating tool to avoid the possibility of pinching your hand between the tool and the object you are working on.
- Pay close attention to the movement of the cutter. If the cutter twists or rotates excessively, stop and reposition. Continuing to operate the tool when this condition exists could lead to blade damage or breakage.
- When lifting vertically with a spreader or ram, be sure to use cribbing as you lift to avoid the potential of an object falling and injuring personnel or patients.

Controls & Features

- The fuel valve lever must be in the *ON* position for the engine to run.
- The choke arm activates the choke valve in the carburetor.
    - The *CLOSED* position enriches the fuel mixture for starting a cold engine.
    - The *OPEN* position provides the correct fuel mixture for operation after starting, and for restarting a warm engine.
- The choke arm is engaged when the throttle cable lever is adjusting to the *FAST* position.
- Moving the throttle lever towards you (*FAST* position) will engage full choke and make the engine run faster.
- Pulling the starter grip operates the recoil starter to crank the engine
- All *AMKUS* spreaders, cutters, and rams are operated using a twist grip control valve. Twist to the right to open. Twist to the left to close. Releasing the control will cause it to spring to the center position and stop the tool (Dead man feature).

Task Benchmarks:

Starting Procedure

- Perform proper Daily Check prior to starting the *AMKUS* Power Unit
- Perform the recommended starting method as follows:
    1. The fuel valve lever must be in the *ON* position for the engine to run
        a. *ON* position is all the way to the right
    2. To start a cold engine, move the throttle towards you (*FAST* position) for full choke
    3. Pull the starter grip lightly until you feel resistance, then pull briskly. Return the starter grip gently.
    4. Once the engine starts, gradually throttle back on the throttle lever moving it towards the *SLOW* position
    5. Connect the hydraulic hoses from the power unit to the tool selected.
        a. To connect, rotate the sleeve on the locking female coupling until the locking pin pines up with the notch.
        b. Pull back on the sleeve and insert the male coupling into the female coupling, then release the sleeve.
        c. Rotate the sleeve end to ensure that it is locked.
    6. ***WARNING***: Disconnecting the hydraulic couplings while the hose is pressurized or engaging the line without properly connecting the hydraulic hoses can cause severe injuries due to thousands of pounds of hydraulic pressure within the system.
    7. Engage the appropriate hydraulic line
    8. Operate the *AMKUS* tools per HFD **TS-14 Hydraulic Extrication**

Stopping Procedure

1. To stop the engine in an emergency, turn the fuel lever to the *OFF* position
2. Under normal conditions, move the throttle lever to the *SLOW* position and then *STOP* to the position to stop the engine.

Maintenance Procedures

Daily Checks

- Perform a visual inspection on power unit: look around and underneath for signs of leaks and/or damage
- Check the fuel level. Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.
- Check the hydraulic fluid through sight gauge

- Inspect hoses and tools for damage, wear, and leaks.

Weekly Checks

- Perform Daily Checks
- Check the engine oil level. Running the engine with a low oil level can cause engine damage.
- Check quick couplings for excessive wear and possible leaks
- Check hydraulic hoses for abrasions and/or bulges
- Check operation of the AMKUS power unit.
    - Run to operating temperature (approximately 5 minutes).
- Check operation of the cutters.
    - Fully open and fully close cutters. When fully closed hold for 10 seconds.
    - Do not store the tool under pressure. Return tips to the storage position with tips crossed approximately ¼".
- Check operation of the spreader.
    - Operate the spreader to the full open position and hold for 10 seconds
    - Do not store the tool under pressure. Return tips to the storage position with tips ¼" apart.
- Check operation of both hydraulic rams.
    - Operate both rams to full extension
    - Do not store the tool under pressure. Return to storage position fully retracted.
- Shut down power unit and restart (Hot Start Check).
- After operation, clean and refuel as necessary.

After Use

- If the AMKUS tools are still serviceable, steps must be taken to ensure readiness prior to placing it back in the apparatus compartment
- To ensure readiness perform a Daily Check
- Allow the engine to cool for at least 15 minutes before loading the power unit back in the apparatus.

Extended Maintenance

- The Fire Equipment Technician will schedule and maintain the *AMKUS* per manufacturer's specifications to include, but will not be limited to:
    - Change fuel in the power unit and spare fuel can quarterly.
    - Change/add hydraulic fluid
    - Check air filter and change annually
    - Check fuel sediment bowl and/or fuel filter
    - Change fuel filter annually
    - Check spark plug and change annually
    - Check carburetor adjustments
    - Change engine oil every six months
    - Remove spreader and cutter arms. Clean and lube wear surfaces and reassemble annually.
    - Check socket head cap screws, which mount the control valve to the valve manifold and the valve manifold to the cylinder cap annually.
    - Check all hydraulic fittings for tightness every six months
    - Clean and lube hose couplings every six months

Extended Operation

- It may be necessary to use the *AMKUS* for extended periods. During lengthy operations it may become necessary to refuel the power unit.
- ***DANGER***: Fuel hot power units with extreme caution. Gasoline spilled onto a hot engine will cause the fuel to vaporize quickly, creating an extreme hazard.

Cleaning

- The AMKUS power unit and tools shall be thoroughly cleaned after each use.
- If the engine has been running, allow it to cool before cleaning.
- Clean all exterior surfaces
- ***CAUTION***: Using a hose or pressure washing equipment can force water into the air cleaner or muffler opening. Water in the air cleaner will soak the air filter, and water that passes through the air filter or muffler can enter the cylinder, causing damage
- ***CAUTION***: Water contacting a hot engine can cause damage. If the engine has been running, allow it to cool before washing.
- Hoses should be wiped clean with a light cleaning solvent
- Couplings and dust caps may be most easily cleaned by immersing in or scrubbing with a standard cleaning solvent.
- Couplings should then be lubricated with a non-water based lubricant such as WD-40.
- Do not cover a clean coupling with a dirty dust cap.

Equipment Specs

- *AMKUS* GH2S-XL Power Unit
    - *Honda* Motor: 5.5 HP, 4 stoke engine
    - Fuel: TRUFUEL 4 cycle, 0.53 gal capacity
    - High pressure, two-stage pumping system
    - Maximum operating pressure: 10,500 psi
    - Utilizes 2 gal. of non-toxic mineral based hydraulic fluid
    - Weight: 94.0 lbs.

- *AMKUS* AMK-30CX Spreader
    - Maximum Spreader Opening: 32.0 in.
    - Maximum Spreader Force: 16,950 lbs.
    - Rated input pressure: 10,500 psi
    - Weight: 47.5 lbs.

- *AMKUS* AMK-25 Cutter
    - Maximum Cutter Opening at tips: 4.1 in.
    - Maximum Cutting Force: 60,000 lbs.
    - Rated input pressure: 10,500 psi
    - Weight: 30.1 lbs.

- *AMKUS* AMK-40R Ram
    - Maximum Push Force: 30,650 lbs.
    - Maximum Pull Force: 14,400 lbs.
    - Rated Input Pressure: 10,500 psi
    - Length Open: 40.0 in.
    - Length Closed: 25.4 in.
    - Weight: 33.0 lbs.

- *AMKUS* AMK-60R Ram
    - Maximum Push Force: 30,650 lbs.
    - Maximum Pull Force: 14,400 lbs.
    - Rated Input Pressure: 10,500 psi
    - Length Open: 60.3 in.
    - Length Closed: 35.5 in.
    - Weight: 43.5 lbs.

Firefighter Equipment Guideline – **12**

PRO/Pak

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the TFT PRO/pak portable foam system.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Percentage Knob: The percentage knob has two sides. The green Class A side and red Class B side.

Flow Control Valve: Controls the flow rate of foam out of the PRO/pak.

Control Block: The control block is made up of both the flow control valve and the foam pick up tube. The control block can be set up for either right or left handed operations.

Safety Operations

- The following safety equipment shall be used in conjunction with PRO/pak operations at all times:
    1. All FRO personnel will be in full Structure PPE and SCBA when utilized in fire suppression operations.
    2. Engineers must have their helmet and gloves on when pumping.
    3. PPE used during training operations will be dictated by the Company Officer.
- This portable foam system can be used in potentially dangerous situations. All safety operations must be observed at all times
- ***DANGER***: Lack of foam can place operator at risk of injury or death. Establish foam flow before advancing into hazardous situations. Make sure you do not run out of foam concentrate before the task is complete.
- ***WARNING*:** Operation of this device without understanding the manual and receiving proper training is a misuse of this equipment. Users who have not read and understood all operating and safety instructions are not qualified to operate this equipment.
- Follow the foam concentrate manufacturer's instructions and HFD **SOP D-10 Foam Operations & TS-06 PRO/pak** for proper use.
- ***WARNING***: Improper use of foam can result in personnel injury or damage to the environment.

- Foam concentrates can be ineffective if not used at the correct percentage. Make sure that the *Percentage Knob* is set to the correct concentration for the type of foam being used.
- ***CAUTION***: Make sure the *Flow Control Valve* is off and the correct nozzle and O*utlet Hose* are securely attached to the *Control Block* before the hose line is charged.
- All personnel shall review the Material Safety Data Sheets for *Phos-Chek* WD 881 foam concentrate and *Angus* Alcoseal FFFP Multi-purpose Firefighting foam and follow their guidelines for storage, handling and use.

General Information:

- The PRO/pak can be used with 0.1% – 1% Class A foam concentrates for wildland, rural, and urban fire suppression on Class A fuels.
    - Intended use for Class A materials includes direct extinguishment, overhaul, and wetting of fuels.
- On Class B materials the PRO/pak is primarily intended to be used for vapor suppression.
    - It can be used with 3% and 6% Alcohol Resistant AFFF Class B concentrates on flammable liquids containing polar solvents.
- The PRO/pak can be used on ignited liquid fuels, but it's foam application rate is very limited.
- Based on NFPA 11 this unit should not be used on ***ignited*** Class B fuels with an area greater than 120 square feet or burning polar solvents with an area greater than 60 square feet.
- The *Control Block* and *Valve Assembly* can be mounted on the foam tank for right or left hand operation. See *TFT* PRO/pak manual for information on changing position.
- Class A foam concentrates are generally less viscous than Class B foam concentrates. Do not use 1% Class B concentrates with the percentage knob set at 1% on the Class A side knob. Using 1% Class B foam on the 1% Class A setting may cause the actual percentage to be less than 1%.

Nozzle Selection

- Straight Stream Nozzle: is for Class A foam solutions. Foam expansion will be negligible. It should be used where maximum reach or penetration is desired.

- Low Expansion Nozzle: can be used with either Class A or B foam solutions. Reach is slightly less than the smooth bore. It should be used on Class B fires for extinguishment and Class A fuels to soak the fuel with a wet foam solution.
- Medium Expansion Nozzle: produces the greatest expansion ratios. It should be used on Class B fuels for vapor suppression and Class A fuels when a longer lasting insulating layer of drier foam is desired.
- The PRO/pak eductor will not work if the backpressure from the outlet hose or nozzle is too high. Adding additional hose, or using other hose assemblies and nozzles, may cause the PRO/pak to not function properly.
- There is no check valve in the PRO/pak eductor system. Do not install a shut off valve between the PRO/pak and the nozzle. This can cause the foam tank to fill with water and dilute the foam concentrate.

Task Benchmarks

1. Obtain PRO/pak from apparatus compartment and position at site of operation.
2. Fill with foam concentrate.
    - Unscrew the fill port lid by turning counterclockwise.
    - Fill tank to bottom of fill port.
    - Overfilling will cause foam to seep out of vents.
    - Close the fill port lid and set the selector wheel on the lit to indicate type of foam in the tank.
3. Attach inlet fire hose to the coupling on the inlet end of the PRO/pak.
    - For maximum maneuverability, attach 1” hose to the PRO/pak itself.
4. Select the appropriate nozzle from the molded compartments on the side of the tank.
    - The nozzle may be attached directly to the quick-connect fitting on the control block or to the end of the outlet hose which is then attached to the control block.
    - Twist the nozzle or hose one quarter turn to the tight to latch the quick-connect fitting.
5. Set Foam Concentration
    - Remove the nut on top of the percentage knob and lift the knob to select the proper foam concentrate type.
    - Replace the knob nut.
    - Turn the knob to the desired concentrate percentage.
    - The knob may be turned to the OFF position for water use only.

6. Charge the hose line.
7. Turn the flow control valve handle to start water flowing through the PRO/pak.
8. Adjusting the flow control valve will determine the flow quality.
9. Operate PRO/pak and apply foam blanket per HFD **TS-06 PRO/pak** and **SOP D-10 Foam Operations.**

Maintenance Procedures

Extended Operation

- It may be necessary to operate the PRO/pak for extended periods. During lengthy operations it may become necessary to refill the foam tank.
- *Refilling Foam*: Refilling foam will require shutting down the line to the PRO/pak. This should not be done if you will be put in danger.

Shut Down After Use (Flushing)

- The PRO/pak should be flushed with water after each use to prevent foam concentrate from drying out inside the Control Block and Percentage Knob.
  1. Reduce pump pressure to 100 psi or less.
  2. Remove the nozzle and/or hose from the quick-connect on the front of the Control Block.
  3. Remove the Circle Cotters and pull out the two Pull Pins that hold the Control Unit to the tank.
  4. Pull straight up to remove the Control Unit and Pickup Tube from the tank.
  5. Make sure the Percentage knob is NOT in the OFF position.
  6. Install the Cap on the outlet of the Control Block.
  7. Turn the Flow Control valve until a trickle of clean water is flowing out the end of the Pickup Tube.
  8. Turn the Percentage Knob back and forth to make sure all foam passages are flushed.
     - Flush all nozzles used.
     - Dump out all remaining concentrate back into foam bucket.
     - Flush PRO/pak tank.
  9. Shut off water and reinstall the Control Unit on the tank and insert the Pull Pins and circle cotters.
  10. Remove the Cap.
  11. The exterior of the PRO/pak can be washed off with the hose or straight stream nozzle with the percentage knob in the OFF position.
  12. Store the PRO/pak empty.

Daily Checks

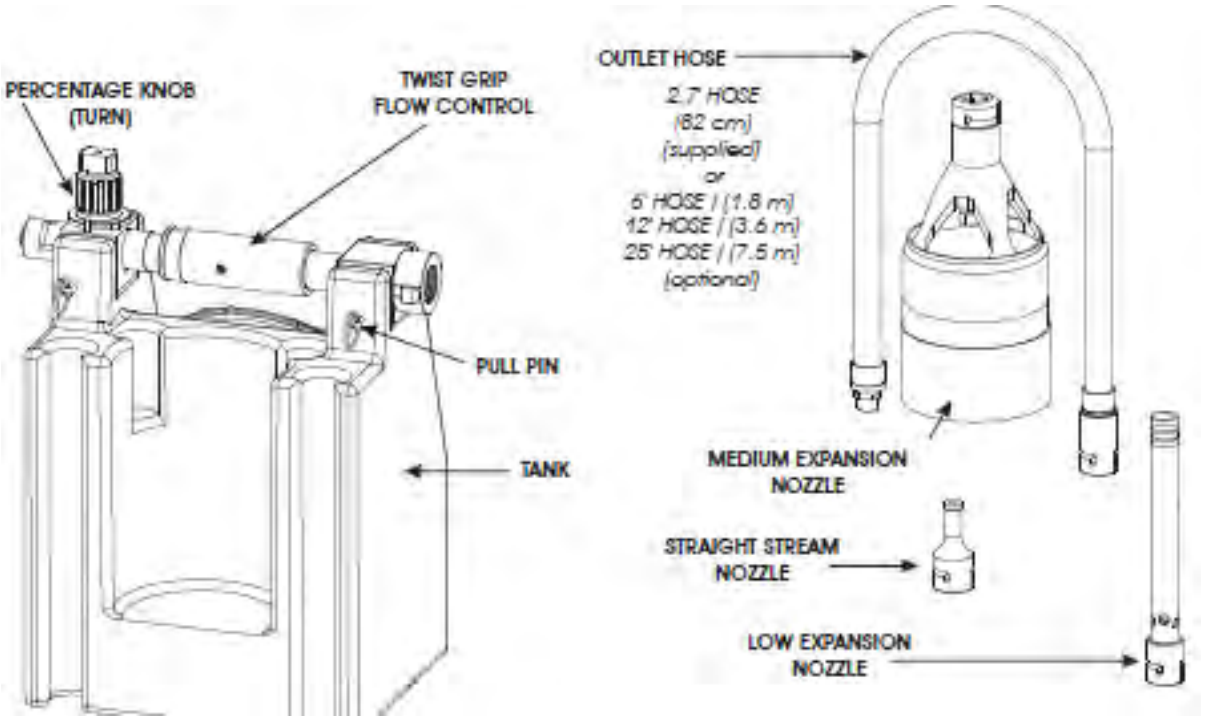
- Check for appropriate PRO/pak inventory (nozzles, hose, reducer).

Weekly Checks

- Perform Daily Checks.

Equipment Specs

- *Task Force Tips* PRO/pak UM12
- Tank Capacity: 2.5 gal
- Nominal flow (all nozzles): 12 gpm at 100 psi
- Empty weight: 11.5 lbs.
- Weight full: 30.1 lbs.
- Operating pressure max/min: 500/40 psi
- Nozzle Reach
    - Straight stream: 50 ft at 100 psi
    - Low expansion: 37 ft at 100 psi
    - Medium expansion: 9 ft at 100 psi
- Use in conjunction with 1" *Snap Tite*, HFX, 100' yellow, nitrile hose



Firefighter Equipment Guideline – **13**

In-Line Foam Eductor

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the *TFT* 95 GPM In-Line Foam Eductor.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Proportioning Knob: The proportioning knob rotates clockwise and counterclockwise. Turn the knob to set the proportioning rate.

Metering Head: The metering head contains a red back flush button that can be depressed to open the check disk. The metering head also has a large proportioning knob that can be rotated to align a ball valve to six different detent positions: Off, ¼ %, ½%, 1%, 3%, and 6%. The eductor cannot be operated between settings, as the metering orifices will not line up properly. The setting on the proportioning knob lines up with the white indicator ball.

Safety Operations

- The following safety equipment shall be used in conjunction with In-Line Foam Eductor operations at all times:
    1. All FRO personnel will be in full Structure PPE and SCBA when utilized in fire suppression operations.
    2. Engineers must have their helmet and gloves on when pumping.
    3. PPE used during training operations will be dictated by the Company Officer.
- This portable foam system can be used in potentially dangerous situations. All safety operations must be observed at all times
- ***DANGER***: Lack of foam can place operator at risk of injury or death. Establish foam flow before advancing into hazardous situations. Make sure you do not run out of foam concentrate before the task is complete.
- Make sure the meter head is set to the OFF position and the correct nozzle and hose lay are securely attached to the eductor before the hose line is charged.
- Make sure the nozzle gallonage matches eductor's gallonage.
- Make sure the hose lay does not exceed the maximum listed in the operating instruction.
- ***WARNING*:** Operation of this device without understanding the manual and receiving proper training is a misuse of this equipment. Users who have not read and understood all operating and safety instructions are not qualified to operate this equipment.
- Follow the foam concentrate manufacturer's instructions and HFD **SOP D-10 Foam Operations & TS-05 In-Line Foam Eductor** for proper use.

- ***WARNING***: Improper use of foam can result in personnel injury or damage to the environment.
- Foam concentrates can be ineffective if not used at the correct percentage. Make sure that the *Proportioning Knob* is set to the correct concentration for the type of foam being used.
- All personnel shall review the Material Safety Data Sheets for *Phos-Chek* WD 881 foam concentrate and *Angus* Alcoseal FFFP Multi-purpose Firefighting foam and follow their guidelines for storage, handling and use.

General Information:

- The eductor proportioning rate ranges from 0 .25%,0 .5%, 1%, 3%, to 6%.
- The *TFT* eductor can be used with 0.25% or 0.5% Class A foam concentrates for wildland, rural and urban fire suppression on Class A fuels (wood, paper, combustible materials). On Class A materials the eductor is intended to be used for direct extinguishment, overhaul, and wetting of fuels.
- On Class B materials, the eductor is primarily intended for vapor suppression or extinguishment. They can be used with high viscosity 1%, 3%, 6%, 3x3% and 3x6% Alcohol Resistant Class B concentrates on flammable liquids containing polar solvents.
- The eductor can also be used with plain AFFF concentrates rated at 1%, 3%, or 6%, with various freeze protected foams, and with FFFP foam types. These foams generally have a lower viscosity than the calibration viscosity of the *TFT* eductor and will be inducted faster than expected resulting in stronger concentrations. While this does not degrade foam quality, it does reduce the operating time for a given foam supply.
- Class A foam concentrates are generally less viscous than Class B foam concentrates. Using 1% Class B foam percentage setting to educt Class A foam, may cause the actual Class A foam percentage to be more than 1%.

Nozzle Selection

- Eductors work with any nozzle whose gallonage is equal or larger than eductors'. However, if a larger gallonage nozzle is used, the reach of nozzle and the proportioning rate of the eductor will be compromised.
- Fog-type nozzles have the greatest reach in the straight stream position. The finished foam is produced as the stream projects forward, and the greatest expansion is at the end of the stream. While straight stream gives maximum reach, it can also splash flammable liquids if not carefully applied. The stream impact can be softened by deflecting the stream off nearby objects. The stream can also be trimmed to a 10-15 degree pattern which gives good reach and creates a softer "snow-flaking" effect at the end of the stream.
- Air-aspirating devices, such as the *TFT* FOAMJET, allow a wider selection of foam concentrates to be used, and can produce a better quality of finished foam. This thicker foam blanket has better vapor suppression and is longer lasting than foam from non-aspirated nozzles. The final expansion ratio and the amount of finished foam, depends on the type of foam concentrate being used.
- The nozzle must be operated fully open to prevent excessive back pressure which will prevent foam pickup.

Maximum Hose Lay

- The maximum hose lay is based on the back pressure. Pushing the foam solution through the hose and nozzle causes back pressure on the eductor. If the back pressure is over 130 PSI the eductor will not work. However, when proportioning rate is no more than 1%, 140psi back pressure is acceptable.

TFT Inline Eductor Maximum Hose Lay and Elevation Chart

Eductor Rating	Hose Size Inch	3% - 6% Solution				Up to 1% Solution			
		100 psi Nozzle		75 psi Nozzle		100 psi Nozzle		75 psi Nozzle	
		Maximum Hose Lay Ft	Elevation Ft	Maximum Hose Lay Ft	Elevation Ft	Maximum Hose Lay Ft	Elevation Ft	Maximum Hose Lay Ft	Elevation Ft
95 GPM at 200 PSI	1.5	100	10	200	10	150	10	300	10
		—	—	150	50	100	50	200	50
		—	—	—	—	—	—	100	100
	1.75	200	10	350	10	300	10	450	10
		—	—	250	50	150	50	350	50
		—	—	100	100	—	—	200	100
	2	350	10	700	10	500	10	900	10
		150	50	500	50	300	50	600	50
		—	—	150	100	—	—	300	100

Task Benchmarks

1. Remove In-Line Eductor from apparatus compartment.
2. Select and remove appropriate hose lines off engine.
3. Connect and use up to 400' of 2 ½" or 3" hose before the eductor.
4. Up to 300' of 1 ¾" hose can be used after the eductor.
5. Complete connections and operate In-Line Eductor per HFD **TS-05 In-Line Eductor** and **SOP D-10 Foam Operations**

Maintenance Procedures

Extended Operation

- It may be necessary to operate the In-Line Eductor for extended periods.
- The following table indicates the theoretical foam concentrate flow rate and the time it will take to empty a 5 gallon container of foam:

Setting	Foam Class	Time to Empty 5 Gallons	Foam Flow Rate
¼ %	A	20 min 50 sec	0.24 GPM
½ %	A	10 min 25 sec	0.5 GPM
1 %	A	5 min 16 sec	1.0 GPM
3 %	B	1 min 45 sec	2.9 GPM
6 %	B	53 sec	5.7 GPM

Shut Down After Use (Flushing)

- The In-Line Eductor should be flushed with water after each use to prevent foam concentrate from drying within the appliance.
  1. After use take the pick up tube out of the bucket and turn down the pump pressure below 75 PSI.
  2. Shut off the nozzle.
  3. Restrain the pick up tube and expect a rapid discharge of water especially at 6% setting.
  4. Push the red flush button and run fresh water through the pick up tube and metering head on each setting until there is no visible foam in the flush water.
  5. Retract the lock ring to remove the metering head.
  6. Turn off the water supply and remove the eductor from the hose so that any remaining foam residue can be washed from the wand, metering head, and eductor
  7. Once the In-Line Eductor flows clear water ensure that you:
     - Flush all nozzles used.
     - Flush all hose used.
  8. Store the eductor clean and dry upon return to apparatus compartment.

Daily Checks

- Check for correct In-Line Eductor inventory (eductor, nozzles).

Weekly Checks

- Perform Daily Checks.

Equipment Specs

- *Task Force Tips* In-Line Eductor
- 125 Series 95 GPM Eductor model #UE-095
- Inlet Pressure 200 PSI
- Maximum back pressure 130 PSI
- 1 ½" coupling
- 36" long pick up hose with 20" metal pick up tube

Firefighter Equipment Guideline – **14**

Vehicle Access Kit

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the *High Tech Vehicle Access Tools* Vehicle Access Kit.

Level of Training: All Fire/Rescue Operations Personnel

Safety Operations

- The following safety equipment shall be used in conjunction with the Vehicle Access Kit operations at all times:
    1. Gloves
    2. Eye Protection
    3. Safety Vest if working on the road
- Safe use of the Vehicle Access Kit shall be in accordance with HFD **SOP G-09 Entry Into Locked Vehicles**.
- Safety is the number one priority. Ensure personal, crew, and scene safety before beginning any vehicle access operations.
- When an emergency exists involving a locked vehicle, every attempt shall be made to gain entry into the vehicle utilizing cautious application of appropriate procedures to minimize property damage.
- Whenever feasible, the owner of the vehicle shall be advised that the Henderson Fire Department assumes no liability for any damages that may be incurred as a result of this action.
- Having a basic awareness and working knowledge of automobile locking mechanisms and anti-theft systems can aide in gaining access to a locked vehicle without damage.
- The Vehicle Access Kit contains essential tools necessary to gain access to virtually any vehicle on the road quickly, safely, and effectively.

Task Benchmarks:

- Perform a Scene Size Up: Ensure personal, crew, and scene safety.
- Perform a Vehicle Size Up: Determine the most appropriate point to attempt access.
    - Locate automatic locking buttons, auto window buttons, and manual locks on doors.
- Try Before You Pry: Attempt to open all vehicle doors, windows, hatches, and lift gates before attempting access with the Vehicle Access Kit.
- Select the appropriate tool to create a purchase point (Pivot Master/Hand Jack).

- Place the plastic shield between the door and vehicle body.
    - Make sure the plastic lays flat by inserting it behind the weather stripping. If it does not lay flat the shield should not be used.
    - The Pivot Master Pivot Plate can be used in conjunction with the Pivot Master to further protect the vehicle paint.
- Place tool between door and vehicle body to create a purchase.
- Once a purchase point is made and the gap is widened, insert wedge or utilize Air Jack to further separate the door from the frame.
- After creating a sufficient gap between the door and vehicle body utilize a Long Reach tool or Unlock Button Puller to unlock door.

Troubleshooting

- Many newer vehicles have enhanced safety and anti-theft systems. Some of these vehicles disengage power to power locks when the vehicle detects signs of forced entry.
    - In these circumstances best access will be to break out a window.
- Utilizing the One Hand Jack tool between doors at the top edge of the door frame to create a purchase point should work well on the majority of vehicles.
- Utilizing the Jack tool against the roof panel or against thin sheet metal is not recommended.
- If access is unsuccessful with a specific set of tools, try another strategy before resorting to breaking a window.

Maintenance Procedures

Daily Check

- Visually inspect Vehicle Access Kit for correct tool inventory.

Weekly Checks

- Perform Daily Check.
- Check Air Jack and Super Air Jack inflation. Inflate both and Air Jacks, and apply pressure to check for any leaks.
- Manipulate Unlock Button Puller to ensure serviceability.
- Maintain tool cleanliness as needed.

After Use

- Ensure all tools are still serviceable prior to placing the kit back in the apparatus compartment.
- Perform Daily Check.
- Perform Weekly Check on any affected equipment.

Equipment Specs

- *High Tech Vehicle Access Tools*: Vehicle Access Kit
- Equipment Includes:
    - Air Jack (1)
    - Super Air Jack (1)
    - One Hand Jack Tool (1)
    - One Hand Jack Tool with Wedge (1)
    - Pivot Master Tool (1)
    - Pivot Plate (1)
    - Plastic Shield (1)
    - Plastic Wedge (1)
    - Unlock Button Puller (1)
    - Rigid Long Reach Tool (1)
    - Flexible Long Reach Tool (1)
    - Slim Jim (2)
- The Hand Jacks and Pivot Master use gentle leverage to slowly apply pressure, allowing easy wedge insertion.
- Tools feature protective coatings that will not scratch the vehicle.
- The bladders of all Air Jacks are made out of ballistic nylon, not rubber. This is important because rubber will grab the stripping during insertion while nylon will not.
- To further aid Air Jack insertion, there is a built in stiffener that prevents the wedge from bending when you insert it.

Firefighter Equipment Guideline – **15**

Gas Tracer GX-2012

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the radiation monitor.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Flow Chamber: Located on the back of the GX-2012 and is held in place by three Phillips screws. The flow chamber seals to the rubber sensor gasket which seals to the sensor faces inside the GX-2012 and routes flow from the pump to the sensors and to the exhaust port (also a part of the flow chamber).

PPM: Parts Per Million is commonly used as a measure of small levels of pollutants. PPM is the mass ratio between the pollutant component and the solution.

PPM is defined as 1% = 10,000 PPM.

LEL: Lower Explosive Limit is the lowest concentration (%) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). At a concentration in air lower than the LEL, gas mixtures are "too lean" to burn. Methane gas has a LEL of 4%. If the atmosphere has less than 4% methane, an explosion cannot occur even if a source of ignition is present.

UEL: Upper Explosive Limit is the highest concentration (%) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). Concentrations higher than UEL are "too rich" to burn.

Thermal Conductivity Detector: A thermal conductivity detector is based on the principle that gases differ in their ability to conduct heat.

Safety Operations

- The safe use of the Radiation monitor shall be in line with **HFD Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response**.
- The following safety equipment shall be used in conjunction with the Radiation monitor operations at all times:
    1. Full Structure PPE
    2. SCBA
- Read and understand this guideline before operating. Improper use of the gas monitor could result in bodily harm or death.

- The GX-2012 uses an advanced detection system consisting of up to five gas sensors.
- The GX-2012 detects the presence of combustible gas, oxygen (O2), and carbon monoxide (CO) simultaneously.
- As liquids reach or exceed their flashpoints the amount of flammable vapors will increase.
- The GX-2012's compact size and easy-to-use design makes it ideally suited for a wide range of applications.
- In RESCUE settings there are NO RED LIGHTS for LEL %.
- In RECON settings 10% of LEL is the RED Light for turnouts and SCBA.
    - The operator should never exceed 1% of the LEL in any other ensemble.
- ***WARNING***: The GX-2012 detects oxygen deficiency, elevated levels of oxygen, combustible gases, carbon monoxide, and hydrogen sulfide, all of which can be dangerous or life threatening.
- ***WARNING***: To prevent ignition of a hazardous atmosphere, batteries must only be changed or charged in an area known to be nonhazardous.

Basic Functions:

- The GX-2012 uses up to five sensors to monitor combustible gas, oxygen (O2), carbon monoxide (CO), and hydrogen sulfide (H_2S) simultaneously. The sensors are located inside the GX-2012 and are held in their sockets by the flow chamber.
- The % LEL sensor detects combustible gas in the % LEL range. It uses a catalytic element for detection. The reaction of gas with oxygen on the catalyst causes a change in the resistance of the element which affects the current flowing through it.
- The % volume sensor detects combustible gas in the % volume range. It uses a thermal conductivity (TC) element for detection. The presence of combustible gas cools the element causing a change in the resistance of the element which affects the current flowing through it.
- Three red alarm LED arrays are visible through frosted plastic lenses in the case. One is on the top front, one on the left side, and one on the right side. The alarm LED arrays alert you to gas, low battery, and failure alarms.
- One solid-state electronic buzzer is located inside the case. Holes on the top front of the case allow the sound to exit the case. The buzzer sounds for gas alarms, malfunctions, and low battery voltage.
- A vibrating motor inside the GX-2012 case vibrates for gas alarms, unit malfunctions.

Control Buttons

- Five control buttons are located below the LCD. They are arranged around a central button, the POWER ENTER button.
- The DISPLAY (ADJ) button is on the left, the RESET SILENCE button on the right, the AIR Δ button on the top, and the (SHIFT) Δ is on the bottom.

Button	Function(s)
POWER ENTER	• turns the GX-2012 on and off. • used during setup and calibration.
RESET SILENCE	silences and resets audible alarm if the GX-2012 is programmed for latching alarms and the alarm silence option is on [1]
DISPLAY (ADJ)	• activates Display Mode • enters instructions into the GX-2012's microprocessor
AIR▲	• activates the demand-zero function (automatically adjusts the GX-2012 in fresh-air conditions) • scrolls through the display and settings modes
(SHIFT)▼	• scrolls through the display and settings modes • enters instructions into the GX-2012's microprocessor

Task Benchmarks

1. Operate the GX-2012 Gas Tracer per HFD **Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response.**
2. Turn on and adjust the Gas Tracer in a known fresh air area
3. Attach the rubber nozzle or sample hose to the Gas Tracer's quick connect inlet fitting.
4. If a hose is used attach probe to hose.
5. To turn on the Gas Tracer, press and briefly hold the POWER ENTER button until you hear a beep.
6. The Normal Mode Select Screen will display. Use the AIR or SHIFT button to scroll to the desired operational mode screen and press and release POWER ENTER.
7. The Gas Tracer will begin its warm up sequence. The following screens may appear during the warm up sequence:
    a. CAL TIME REMAINING (factory set to appear)
        i. If the instrument is overdue for calibration, the GX-2012 displays CAL. Press the RESET SILENCE button to continue.
        ii. Calibration should be performed as soon as possible.
    b. BUMP TIME REMAINING (does not appear with factory setting)
        i. If the instrument is overdue for bump testing, the Gas Tracer displays "tESt B— Limit". Press the RESET SILENCE button to continue.
        ii. A bump test should be performed as soon as possible.
    c. SENSOR FAILURE
        i. If the GX-2012 experiences a sensor failure during start up, the LCD will display FAIL and indicate which sensor(s) failed. To continue operation press and release RESET SILENCE to acknowledge the failure. Gas readings for that sensor will be replaced by "--- ".
        ii. It is necessary to replace the sensor and recalibrate before the Gas Tracer is used.
8. In the Measuring Mode Screen after warm up the GX-2012 will display the following:
    a. CH_4 0%LEL, OXY 20.9%, CO 0ppm.

9. If the readings are not displaying fresh air values as above, you must perform a Fresh Air Adjustment.
10. To Monitor an Area take the GX-2012 to the monitoring area. I f the tapered rubber nozzle is used, put the nozzle tip in the area to be monitored. If the hose and probe is used, put the probe tip in the area to be monitored.
11. Wait 10-15 seconds and observe the display for gas readings. If a reading is observed, allow the reading to stabilize to determine the concentrations present.
12. ***NOTE***: Response time increases with the length of the sample hose. Long sample hoses will require more time to show a response at the GX-2012. The maximum sample hose length recommended for the GX-2012 is 50 feet.
13. If a gas alarm occurs, take appropriate action. See "Responding to Alarms".
14. To turn off the GX-2012 press and hold the POWER ENTER button until TURN OFF has disappeared from the bottom of the screen.

Measuring Mode, Alarms

Alarm Indications

- ***NOTE*:** False alarms may be caused by radio frequency (RF) or electromagnetic (EMI) interference. Keep the GX-2012 away from RF and EMI sources such as radio transmitters or large motors.
- The GX-2012 will sound an alarm, the unit will vibrate, and the LED arrays will flash when one of the target gas concentrations rises above the Warning level, or in the case of oxygen, falls below the Low Alarm setting for that gas.
- The GX-2012 also sounds an alarm, vibrates, and flashes the LED arrays when the Alarm level is reached for combustible gas, CO, and H2S, when the concentration of oxygen rises above the High Alarm level, and when the STEL and TWA alarm points are reached for CO and H2S.
- When a failure condition occurs, such as a sensor failure, low flow, or dead battery condition, the unit will also sound an alarm, flash the LED arrays, and vibrate.
- The table below summarizes the types of alarms produced by the GX-2012.

Alarm Type	Visual Indications	Other Indications
Low Alarm Concentration of gas rises above the Warning level, or falls below the Low Alarm level for O_2.	- WARNING appears below the gas list. - Reading for the gas in alarm flashes - Alarm LED arrays flash - Backlight turns on	- Buzzer sounds alternating between a low and high pitch - Vibrator pulses

High Alarm Concentration of gas rises above the Alarm level, or rises above the High Alarm level for O_2.	- ALARM appears below the gas list. - Reading for the gas in alarm flashes - Alarm LEDs flash faster than warning indication - Backlight turns on	- Buzzer sounds alternating between low and high pitch faster than warning indication - Vibrator pulses faster than warning indication
TWA or STEL Concentration of CO or H_2S rises above the TWA or STEL alarm point setting.	- TWA or STEL appears below the gas list. - Alarm LEDs flash - Back light turns on	- Buzzer sounds alternating between a low and high pitch at the same rate as warning indication - Vibrator pulses at same rate as warning indication
Over Range*	- Gas reading replaced by brackets flashing at same rate as alarm indication ⊓⊓⊓⊓ - Alarm LEDs flash at same rate as alarm indication - Back light turns on. - OVER appears below the gas list.	- Buzzer sounds alternating between a low and high pitch at same rate as alarm indication - Vibrator pulses at same rate as alarm indication
Low Flow*	- The display indicates **FAIL LOW FLOW** - The Alarm LED's flash	- Buzzer sounds a double pulsing tone (two pulses in quick succession)
Low Battery Warning*	- Battery icon blinks	- None
Dead Battery Alarm*	- Gas readings replaced by **FAIL** - Fan symbol disappears - BATTERY displayed along bottom of screen - Alarm LED arrays flash	Buzzer sounds a double pulsing tone (two pulses in quick succession)
Sensor Failure*	- **FAIL** appears at the bottom of the display and the failed sensor(s) are indicated - Alarm LED arrays flash	Buzzer sounds a double pulsing tone (two pulses in quick succession)
Clock Failure*	- FAIL CLOCK appears on the display - Alarm LED arrays flash	Buzzer sounds a double pulsing tone (two pulses in quick succession)
System Failure*	- FAIL SYSTEM appears on the display - Alarm LED arrays flash	- Buzzer sounds a double pulsing tone (two pulses in quick succession) - A failure code appears
Microprocessor Failure* - NOTE: The unit will not operate if this alarm occurs.	- Heart indicator is steadily on or not on at all	- None

Responding to Alarms

- Determine which gas alarm has been activated.
- Follow **HFD Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response** for an increasing gas condition or a decreasing oxygen condition.
- If necessary, reset the alarm using the RESET SILENCE button once the alarm condition has been cleared.

Maintenance Procedures

Batteries

- Three AA-size alkaline batteries power the GX-2012.
- At 77°F the alkaline batteries last up to 15 hours.
- The battery icon in the upper right of the LCD shows remaining battery life.
- When the GX-2012 detects a low battery voltage, a low battery warning is activated. When battery voltage is too low for normal operation, the GX-2012 sounds a dead battery alarm.
- The alkaline batteries can be replaced by removing the battery cover on the back of the case.
- ***NOTE*:** Use of batteries or battery chargers not specified by RKI Instruments, Inc. will void the CSA classification and may void the warranty.
- ***WARNING:*** To prevent ignition of a hazardous atmosphere, batteries must only be changed or charged in an area known to be nonhazardous.

Daily Checks

While periodic maintenance and calibration of the GX-2012 Gas Tracer will be handled by the HFD Equipment Technician, all FRO companies will perform Operational Checks on the units assigned to them.

- Visualize the GX-2012 in Pelican case.
- Turn on unit and check battery life.

Weekly Checks

- Check the calibration due date. If calibration is within 30 days of expiration, coordinate with HFD Equipment Technician for transfer of unit for re-calibration.
- Perform a visual inspection for broken or missing parts.
- Perform a Daily Check.
- Perform a Fresh Air Adjustment if necessary
- All other required maintenance/calibration (Flow Integrity Test, Breath Test, etc.) will be performed by the HFD Equipment Technician.

Fresh Air Adjustment

- Performing a Fresh Air Adjustment will set the CH_4, CO, and H_2S channels to 0 and the OXY channel to 20.9%.
- Take the GX-2012 to a fresh air area where the air is free of toxic or combustible gas and has normal oxygen (20.9%).
- Press and hold the AIR button. The display will prompt you to continue holding the AIR button.
- The display will prompt you to release the AIR button. The GX-2012 will automatically set the fresh air readings for all channels.
- The GX-2012 is now ready for use.

Equipment Specs

Target Gas	%LEL Combustible Gas (Methane Calibration Standard)*	% Volume Combustible Gas (Methane Calibration Standard)	Oxygen (O_2)	Hydrogen Sulfide (H_2S)	Carbon Monoxide (CO)
Range (Increment)	0-100% LEL (1% LEL)	0 - 100% vol (1% vol)	0-40.0% vol (0.1 vol%)	0-100 ppm (0.5 ppm)	0-500 ppm (1 ppm)
Sampling Method	Sample Draw				
Response Time	T90 Within 30 Seconds				
Accuracy	± 5% of reading or ± 2% LEL (whichever is greater)	± 5% of reading or ± 2% full scale (whichever is greater)	± 0.5% O_2	± 5% of reading or ± 2 ppm H_2S (whichever is greater)	± 5% of reading or ± 5 ppm CO (whichever is greater)
Display	Digital LCD Display				
Gas Alarms (Factory Settings)	**Alarm 1** 10% LEL **Alarm 2** 50% LEL	None	**Alarm 1** 19.5 vol% (Decreasing) **Alarm 2** 23.5 vol% (Increasing)	**Alarm 1** 5 ppm **Alarm 2** 30 ppm **TWA** 10 ppm **STEL** 15 ppm	**Alarm 1** 25 ppm **Alarm 2** 50 ppm **TWA** 25 ppm **STEL** 200 ppm
Operating Temperature & Humidity	-20°C to 50°C/Below 85% RH (Without Condensation)				
Safety/ Regulatory	C SP US pending CSA classified, "C/US", as Intrinsically Safe, Exia, Class I; Groups A, B, C, & D. Temperature Code T3C.				
Power Supply	- Three AA size alkaline batteries standard - Lithium Ion Battery Pack (3.7 VDC Nominal) optional, Direct Charging				

Continuous Operating Hours @ 25 °C	- Alkaline Batteries: 15 Hours (Non Alarm Operation, Fully Charged) - Lithium Ion Battery Pack: 10 Hours (Non alarm Operation, Fully Charged)
Case	High-impact Plastic with protective rubber layer, RF Shielded, Dust and Weather Proof
Standard Accessories	- 10 foot hose - 10 inch probe - Flexible 4 inch tapered rubber nozzle
Optional Accessories	- Rechargeable Lithium-Ion Battery Pack - 115 VAC Charging Station - 12 VDC Charging Station - Data Logger Management Program - IrDA/USB Cable for Downloading Data to a Computer With Data Logger Management Program Software (not needed if computer has an infrared port) - SDM-2012 Automatic Calibration Station & Software - Various Probes (see "Parts List" on page 160)
Dimensions and Weight	Approximately 171(H) x 65(W) x 39(D) mm (5.6"H x 2.5"W x 1.5"D) Approximately 310 g (11 oz.)

Firefighter Equipment Guideline – **16**

UltraRadiac Plus Personal Radiation Monitor

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the radiation monitor.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Contamination: Patients will be considered *contaminated* when radiation is in excess of two times the background.

Dose: The total amount of radiation received. Also called the Accumulated Dose.

Dose Rate: The average rate (in time) of radiation exposure; Roentgen per hour (R/hr) also called Rate.

Gamma: One of the three types of natural radioactivity; unlike alpha and beta radiation that are particles, gamma radiation is electromagnetic radiation (like X-rays or microwaves). Gamma rays are the most energetic and far reaching form of electromagnetic radiation with a very short wavelength.

PRD: Personal Radiation Detector

Rate: The amount of radiation measured by the UltraRadiac every 2 seconds, displayed as units per hour.

Roentgen: Unit of radiation exposure (R) that is directly proportional to rem (Roentgen equivalent man) which measures the biological danger of absorbed radiation.

Stay Time: Time remaining (at the current dose) user can remain in place before a High Dose Alarm is activated. If the Dose Rate goes up, remaining Stay Time will go down.

Safety Operations

- The safe use of the Radiation monitor shall be in line with **HFD Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response**.

- The following safety equipment shall be used in conjunction with the Radiation monitor operations at all times:
    1. Full Structure PPE
    2. SCBA
- The potential threat of a radiological terrorism incident requires that first responders be equipped with a radiation monitor designed to address the radiation hazards they may face.
- CANBERRA's UltraRadiac Personal Radiation Detector (PRD) is a small, rugged, simple-to-operate radiation monitor that measures and displays both the instantaneous radiation dose rate, and the total dose that is received.
- Alarms are annunciated by a flashing display and loud audible signal when set dose rate or total dose alarm levels are exceeded. These thresholds have been set prior to distribution and are determined by the **HFD SOP EM-XX Hazardous Materials Response**. They are **not** programmable by Operations-level users.
- There are two separate alarm levels for both dose rate and total absorbed dose. The first alarm (Low Level Alarm) is set at a level somewhat above natural background to alert personnel that abnormal radiation is present. The second alarm (High Level Alarm) is set at a higher level, indicating a significant hazard that requires immediate action.
- The PRD also has a "stay time" feature that shows personnel how much time (at the current dose rate) he/she can remain in place before the high dose alarm is reached.
- Radiological monitoring is also known as survey monitoring.
- All monitoring should start at the apparatus.
- All radiation should be considered dangerous.
- DHS/FEMA guidelines dictate that during an emergency response there are no red lights for radiation.
- A red light for recon is considered to be two times the background.
- Patients will be considered *contaminated* when radiation is in excess of two times the background.

Dose Limit	Emergency Activity Performed	Condition
5,000 millirems (mR)	All activities	All activities during emergency
10,000 mR	Protecting major property	Where lower dose not practicable
25,000 mR	Lifesaving or protection of large populations	Where lower dose not practicable
>25,000 mR	Lifesaving or protection of large populations	Only on a volunteer basis to persons fully aware of the risks involved

Basic Functions:

The Function Keys

- **ON/OFF** Press and hold to turn the unit on or off
- **DOSE** Press to change the Dose Mode (default ON mode is RATE).
    - Current accumulated dose is displayed in R.
- **RATE** Press to change to Rate Mode from Dose Mode.
    - Current Rate is displayed in R/hr.
- **ALARM** Press to see the Stay Time
- **LIGHT** Press to illuminate the display for about 5 seconds.
- **CLR/Test** In the Rate Mode, press and hold to enable the Display Test Sequence

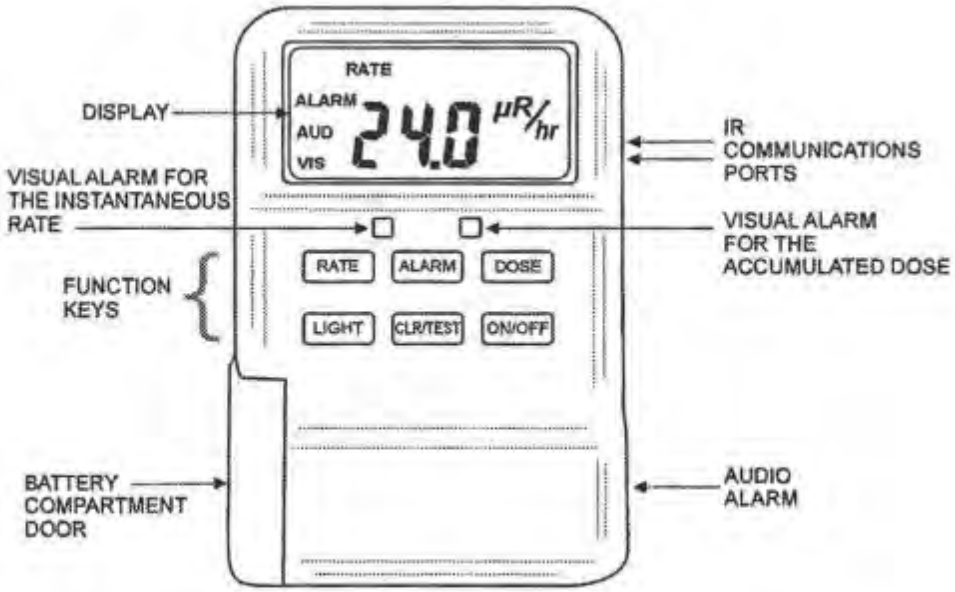


Figure 1 – The UltraRadiac™ Front Panel

Task Benchmarks

1. Operate the UltraRadiac PRD per HFD **Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response.**

Maintenance Procedures

Battery Life Indicators

- If a blinking *b* is displayed, the unit has stopped functioning. Replace the batteries before the unit's next use.
- If a blinking *BAT* is seen in the top-left corner of the display, the unit's batteries have 10 hours or less of useful life. Replace the batteries as soon as possible.
- If the display is blank, the batteries are dead. Replace the batteries before the next use.
- In the Rate mode with the *BAT* indicator blinking, press the CLR/TEST key. A three digit number indicating the approximate remaining battery life, in minutes, will be displayed.
- **NOTE: When replacing batteries at any time, be sure to turn the unit off first!**

Daily Checks

While periodic maintenance and calibration of the UltraRadiac™ PRD will be handled by the HFD Equipment Technician, all FRO companies will perform Operational Checks on the units assigned to them.

- Visualize the UltraRadiac in Pelican case.
- Turn on unit and check battery life.

Weekly Checks

1. Check the calibration due date. If calibration is within 30 days of expiration, coordinate with HFD Equipment Technician for transfer of unit for re-calibration.
2. Perform a visual inspection. Remove dust, moisture, loose dirt from outside surfaces of the unit with a clean, soft cloth. If necessary, the unit may be cleaned with a mild solution of ordinary detergent and water, rinsed, and thoroughly dried.
3. Press and hold the ON/OFF key until the display appears, and release the key.
    - The Rate Mode should appear, with the word *RATE* shown at the top left of the screen (Figure 2).

Figure 2 – The Rate Display

- *AUD* and *VIS* indicate that the Audio and Visual alarms are both enabled.
- The unit will start counting and displaying the instantaneous Rate. Naturally occurring background radiation will cause the unit to display a low reading.
- Press the DOSE key to switch to Dose Mode. The Dose Mode should appear, with the word *DOSE* shown at the top left of the screen (Figure 3).

Figure 3 – The Dose Display

- Press the RATE key to switch to Rate Mode.

4. While in Rate Mode, press and hold the CLR/TEST key until you see the test display in Figure 4 (approximately 4 seconds), and release the key.

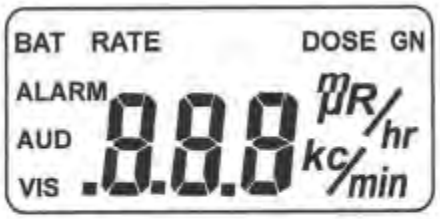


Figure 4 – The Test Display

- A set of numbers in the following order will appear. Check that all of the numbers are exactly as shown in Figure 5.

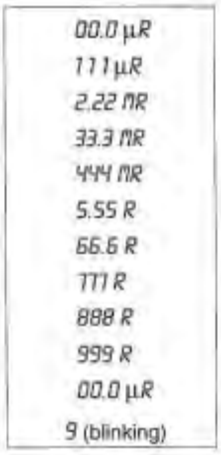


Figure 5 – Test Sequence

- At any time during the CLR/TEST sequence of numbers:
  i. Press the RATE key – the audio alarm should sound and the Rate LED (left one below the display) should turn on.
  ii. Press the DOSE key – the audio alarm should sound and the Dose LED (right one below the display) should turn on.
  iii. Press the ALARM key – the audio alarm should sound and both LEDs should turn on.
- The blinking ***9*** indicates that the unit passed all self-tests. A blinking ***0*** indicates a failure; contact Equipment Tech immediately to arrange replacement.
- Press the CLR/TEST key to return to Rate Mode (or wait about 10 seconds).

5. Press the LIGHT key; the display's backlight will turn on for about 5 seconds.
6. **IMPORTANT: Clear the accumulated dose each day at change of shift!** Press and hold DOSE + CLEAR/TEST. The display will flash for a few seconds, then clear any accumulated dose. Return to the Rate Mode by pressing the RATE key.

7. Press and hold the ON/OFF key.
   - ***OFF*** will be displayed.
   - **- - -** will then be displayed. Release the ON/OFF key; the unit will power off.

Equipment Specs

- CANBERRA UltraRadiac™ Personal Radiation Detector (PRD)
- Gamma detector only – will not detect alpha or beta radiation
- Detection range of 1 µR/hr – 500 R/hr (dose rate) and 0.1 µR to 999 R (total dose)
- Low Rate Alarm set at 100 µR/hr
- High Rate Alarm set at 1 R/hr
- Low Dose Alarm set at 1 R
- High Dose Alarm set at 5 R
- Unit has an initialization time of less than 5 seconds
- Four AAA 1.5V alkaline batteries will provide 150 hours of continuous monitoring
- Low battery indication is triggered when remaining battery life is approximately 10 hours
- Unit is submersible to 3 ft and can be technically decontaminated
- Unit is NOT intrinsically safe
- Weighs 9.5 oz
- OPERATING TEMPERATURE from –22 °F to 141 °F (–30 °C to +61 °C). Vibrating and audible alarms functional to –50 °C.

Firefighter Equipment Guideline – **17**

ph/F Paper

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the ph and F Papers.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Hydrogen Fluoride: Hydrogen fluoride is inorganic acid that contains fluorine. It can exist as a colorless gas, a fuming liquid, or it can be dissolved in water. When hydrogen fluoride is dissolved in water, it is called hydrofluoric acid.

ppm: Parts Per Million is commonly used as a measure of small levels of pollutants. PPM is the mass ratio between the pollutant component and the solution and ppm is defined. 1% = 10,000 ppm.

pH: A numerical measure of the acidity or alkalinity of a solution, usually measured on a scale of 0 to 14. Neutral solutions (such as pure water) have a pH of 7, acidic solutions have a pH lower than 7, and alkaline solutions have a pH higher than 7. The letters *pH* stand for *potential of hydrogen,* since pH is effectively a measure of the concentration of hydrogen ions (that is, protons) in a substance.

Safety Operations

- The safe use of the pH and F Papers shall be in line with **HFD Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response**.
- The following safety equipment shall be used in conjunction with the pH and F Papers operations at all times:
    1. Full Structure PPE
    2. SCBA
- Read and understand this guideline before using.
    - **Improper use of pH and F Papers could result in bodily harm or death.**
- Hydrogen fluoride is rapidly absorbed through the skin and into the tissues in the body. There it damages the cells and causes them to not work properly by binding with calcium.

- The severity of poisoning caused by hydrogen fluoride depends on the amount, route, and length of time of exposure, as well as the age and preexisting medical condition of the person exposed.

- Breathing hydrogen fluoride can damage lung tissue and cause swelling and fluid accumulation in the lungs (pulmonary edema).
- Skin contact with hydrogen fluoride may cause severe burns that develop after several hours and form skin ulcers.
- The F paper is used for the determination of fluoride present in a gas or liquid.
- The pinkish-red paper turns yellowish-white in the presence of fluorides.
- The pH paper is utilized to detect the presence of corrosive gases.

Task Benchmarks

1. Utilize the pH and F papers per HFD **Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response.**
2. Moisten both the pH and F papers prior to use.
3. Affix the pH and F papers to SCBA mask with IV tape prior to exiting the apparatus.
4. Adhere to Rescue/Recon Red Lights.
5. Color change on the pH paper indicates id a gas, liquid, or solid is an Acid (RED) or Base (BLUE). No color change or GREEN indicates Neutral.
    a. (If the product is a weak acid or base the color change may not be as pronounced.)
6. Color change on the F paper indicated presence of anhydrous hydrogen fluoride in the atmosphere.
7. F paper will react at concentrations of 4 ppm.
8. If color change from pink to yellow is indicated, **STOP** and turn around.

    PINK TO YELLOW WILL KILL A FELLOW!

9. The F paper will only react in the air if a corrosive gas is present that contains fluorine.

Maintenance

Weekly Checks

- Visualize the pH and F paper in Pelican case.
- Check the expiration date of both pH and F papers.

Equipment Specs

- CTL Scientific Supply
- Universal pH 1-14 Paper #UNIV-114LD, Roll of 26ft x 5/8in
- Fluoride test paper #F-100, box of 200 strips

Firefighter Equipment Guideline – **18**

Infrared Thermometer/Temp Gun

Goal: To provide an Equipment Guideline Standard to ensure safe, consistent operation and maintenance of the Infrared Thermometer.

Level of Training: All Fire/Rescue Operations Personnel

Definitions:

Polymerization: a chemical reaction in which two or more molecules combine to form larger molecules that contain repeating structural unit. (Commonly seen with double bonded carbons).

Safety Operations

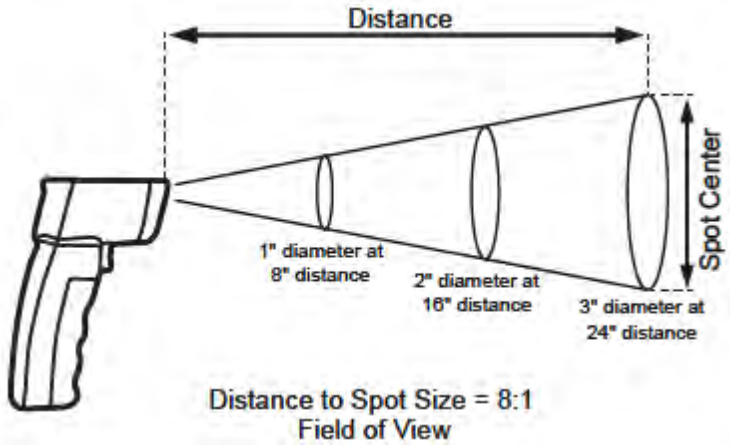
- The safe use of the Infrared Thermometer shall be in line with **HFD Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response**.
- The following safety equipment shall be used in conjunction with the Infrared Thermometer operations during Hazardous Materials incidents:
    1. Full Structure PPE
    2. SCBA
- Avoid direct eye exposure

Basic Functions:

- The temp gun is useful for determining if a combustible liquid (i.e. diesel fuel has reached its flash point 140°) and is now considered a flammable liquid.
- This tool along with the TIC is useful for determining effectiveness of decontamination and large area searches for reacting chemicals (i.e. rail yard or drain system).
- Utilized to identify if a chemical reaction is taking place.
- Reactions will generate a temperature change either hot or cold.
- During polymerization temperatures will increase inside an enclosed vessel.

Task Benchmarks

1. Operate the GX-2012 Gas Tracer per HFD **Administrative Directive 2013-02 Hazmat/WMD Response** and **SOP EM-XX Hazardous Materials Response.**
2. Squeeze the Trigger to activate the Laser and temperature reading.
3. Push the ºF/ºC button to toggle between Fahrenheit to Celsius, and to recover the last reading when in OFF mode.
4. Squeeze the Trigger and move the laser to see a constant temperature reading and max reading.
5. Release the Trigger to display the most recent temperature reading, or to allow 15 seconds for auto shut off.
6. Non-reflective surfaces will yield a more accurate reading than reflective surfaces.
7. The object being tested should be larger than the size calculated by the Field of View diagram, below.



8. When finished, release the Trigger. The last temperature will display for 15 seconds, and then the unit will shut off.

Maintenance Procedures

Weekly Checks

- Visualize the Infrared Thermometer in Pelican case.
- Turn on unit and check battery life.
- Clean the lens with dry compressed air and wipe the rest of the unit down with a soft, damp cloth, as needed.

Equipment Specs

- CEN-TECH Infrared Thermometer with Laser Targeting
- Model # 69465
- Weight: 0.335 lbs.
- Utilizes automatic shut off
- Temperature range: -4°F to 968°F
- Accuracy: +3°F or 2% of reading
- Response Time: 1 sec.
- Uses to AAA batteries